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FERTILIZER TRIAL WITH CABBAGES AT REDLANDS EXPERIMENT STATION.

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Editor: E. T. Hockings.

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Plate 1.

**Mr. Shield's Silo had its beginning in this 60 ft. length of Arc Mesh as Delivered to the Silo Site.**

# New-Type Silos Solved A Fodder Problem

**A Moggill dairy farmer has built a new type of silo to increase his winter and spring fodder stocks. Opened early in July, it showed promise of being a suitable structure for storing surplus summer fodder for use later in the year.**

Running a 30-cow herd on a small area, the farmer, Mr. E. Shield, finds it necessary to get the highest possible forage production from his cultivation. To do this, he found he could not afford to have his cultivation tied up under standover crops. He has irrigation, uses fertilizer and usually practises double cropping.

The answer to his problem seemed to lie in turning some of his summer forage crops into silage. Above-ground types like buns, wedges and clamps did not appeal to him because of their fairly high wastage, so he branched out to try a new type. With the assistance of A.R.C. Engineering Coy., and the manufacturers of Sisalkraft, Mr. Shield built two silos to take care of 80 tons of his maize and sweet sorghum crops.

The new silos are made of steel mesh, lined with "Fibreen." A 60-ft. length of quarter-inch rod steel mesh 7 ft. wide was stood on edge and pulled into a circle. The ends were then overlapped and bolted together. This gave a circle of steel mesh nearly 20 ft. in diameter and 7 ft. high. These steel mesh frames were lined with the hessian-paper preparation, and each was filled with about 40 tons of

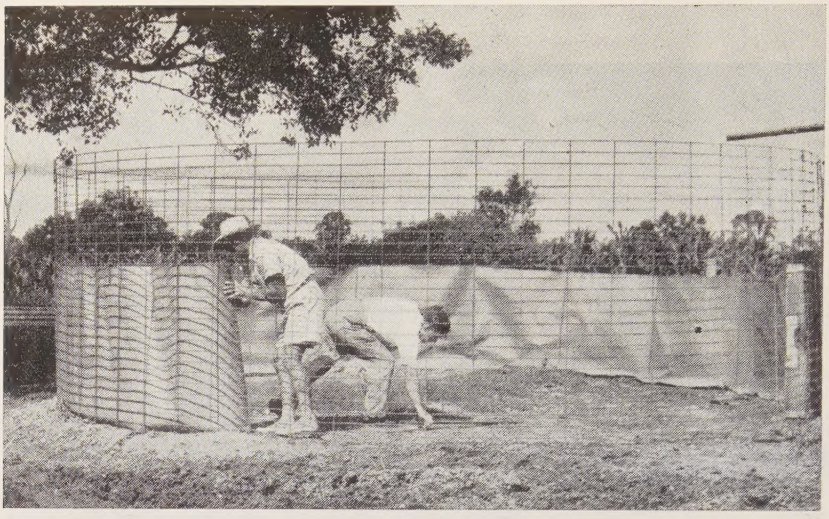


Plate 2.

**The Roll of Arc Mesh is Opened and the Ends Clamped Together.** The "Fibreen" lining is given temporary support from rods hooked at one end which are hung from the mesh.

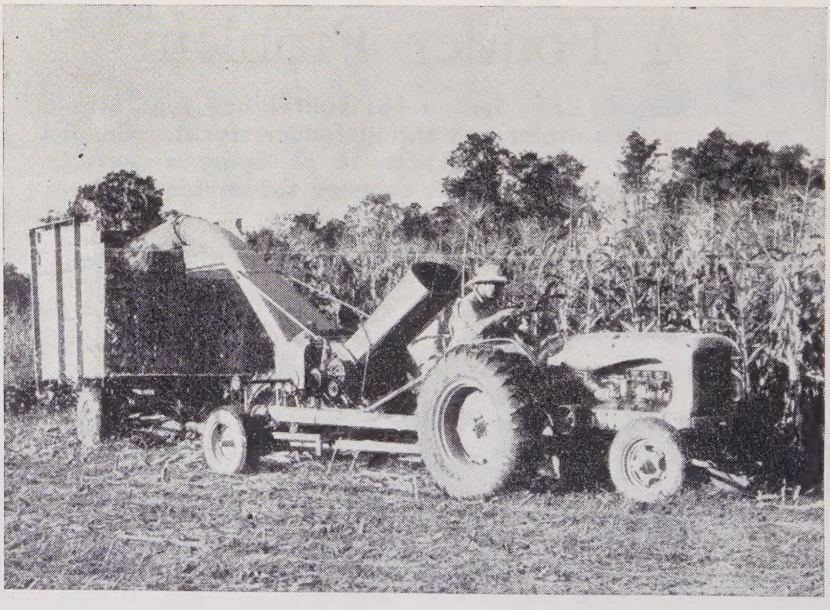


Plate 3.

**The Forage Harvester with Row Crop Attachment Making a Clean Job of Harvesting A Maize Crop.**

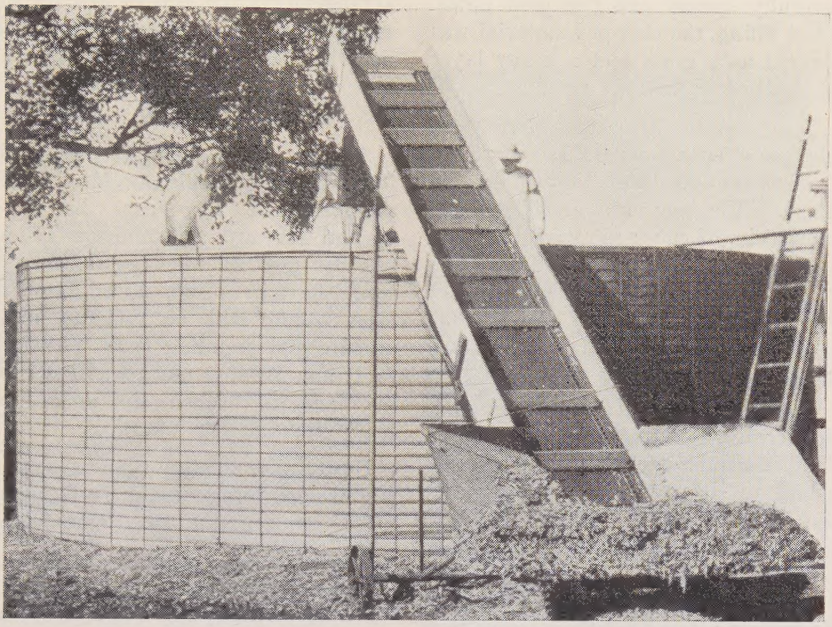


Plate 4.

**The Chopped Crop is Loaded into the Silo, Spread Evenly, and Tramped to Speed the Exclusion of Air.**

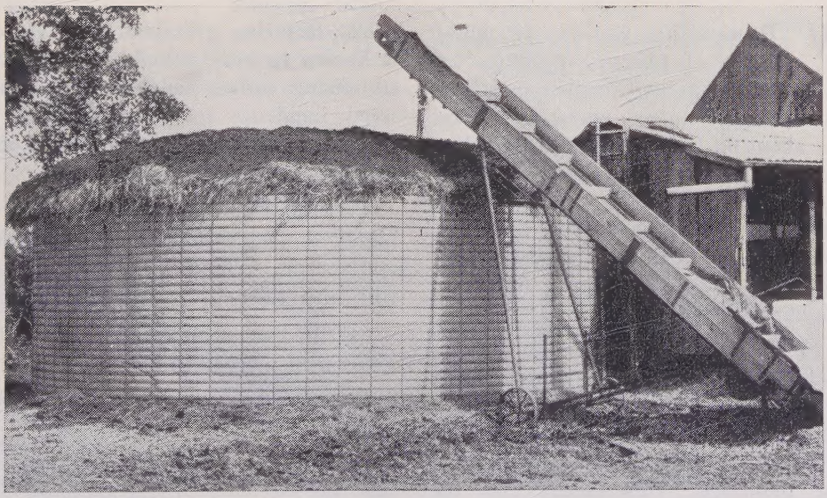


Plate 5.

**The Silage was Mounded Up in the Centre during Filling, and Finally Capped with Grass and a Heavy Layer of Sawdust.**

chopped green material, which was carefully spread and trampled down. After filling, the chopped material was covered with grass and a heavy layer of sawdust to exclude rain.

Three months after filling, the first silo was opened for use. It was found to contain good quality, palatable silage. Wastage was restricted to about 5 in. of chopped material underneath the top seal and small pockets of waste at the upper sides. Wastage was not by any means as high as that usually found in bun, wedge, and clamp silos.

The steel mesh is easy to erect and inexpensive. Cost of the steel mesh is about £18 and its life has been estimated to be at least five years. Material for lining costs £14 and has to be renewed each year. Calculated over the anticipated life of the steel mesh, the cost of materials for building the silo is less than 9s. for each ton of green material ensiled.

When Mr. Shield first discussed his problem with officers of the Department's Agriculture Branch, they made arrangements for him to test the new silo-building materials. The firms handling the material made it available for demonstration purposes and Mr. Shield did the rest.

At this early stage, it seems that the silos are suitable for Mr. Shield's purpose. If the crops had been carried forward as standover fodder, a great deal of their nutritive value would have been lost. In addition, the land would still be tied up under stubble and standing crop. As it is, he is now feeding out good silage and the land is broken up again and ready for another planting.

Use of silos to store surplus summer pasture or forage crops is becoming more widespread in Queensland.

**Stored summer surpluses have an important place in easing the feed shortage normally expected every year in late winter and early spring. Fodder stored for this purpose has the effect of extending the summer grazing season.**

# When Thoughts Turn To Cotton

WITH uncertain markets for many items of primary produce, the cotton crop has two particular attractions: a guaranteed price; a market for about 30 times the present production. Of course, when farmers' thoughts turn to the prospects of growing cotton, they will naturally consider the cultural aspects very carefully. Briefly, some of these might be listed as follows:

(1) For rain-grown cotton in central and southern Queensland early land preparation is necessary to conserve sub-soil moisture and allow preparation of a good seed bed in time for planting. This means that the first ploughing should be done not later than autumn and preferably in the late summer before the cotton is planted.

(2) Rotating grassland with cotton is known to be a valuable practice in stabilising cotton yields and reducing weed incidence in cotton fields. It can also be looked on as a useful method for renovating pastures.

(3) Planting at the right time is highly desirable to have a long growing season. Good land preparation will help this.

(4) Proper stands are a necessity. Top yields cannot be expected without a good stand of plants in every acre. Seed treatment is important here.

(5) Weed control is essential so that all soil moisture is available for the cotton plants, harvesting difficulties are minimised and quality of the seed cotton is not lowered by burrs and other weed seed.

# Feeding Value of Millets

By Officers of the Divisions of Plant and Animal Industry.

**Korean Setaria or "Korean" Panicum," a very recent addition to the millet varieties grown in Queensland for bird seed, is in no way inferior to other panicums. It has been proved that all varieties of millet when grown under the same conditions have approximately the same feeding value.**

For years, Giant Setaria and Dwarf Setaria have been produced in Queensland for the bird seed trade. They have been marketed under the general trade name of "Panicum." Korean is merely another variety of Setaria which differs from the others chiefly in its larger and more branched type of head.

Last season, Korean Setaria was offered for sale under the name of "Korean Panicum." Buyers were reluctant to handle "Korean Panicum" on the suspicion that it was inferior to other panicums. But this suspicion is not justified.

Recent analyses by the Agricultural Chemist show the chemical compositions of a number of millet varieties grown in 1957–58 to be:—

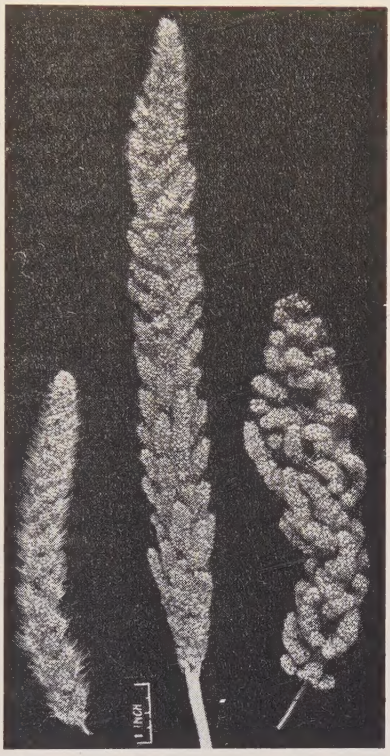


Plate 1.

**Three Different Varieties of Setaria or "Panicum."** From left to right:—(1) The old Giant Setaria. (2) A new introduction by C.S.I.R.O. known as Nunbank Setaria. (3) Korean Setaria.

TABLE 1.

| Type. | Chemical Composition. | | | | | |
|---|---|---|---|---|---|---|
| | Moisture %**. | Protein %. | Fat %. | Fibre %. | Carbo-hydrate %. | Ash %. |
| Setaria, Korean .. .. | 10·0 | 11·4 | 3·0 | 6·6 | 66·7 | 2·3 |
| Setaria, Dwarf* .. .. | 10·0 | 10·8 | 3·9 | 8·0 | 64·4 | 2·9 |
| Setaria, Giant* .. .. | 10·0 | 12·0 | 4·7 | 6·1 | 64·4 | 2·8 |
| White French Millet* .. | 10·0 | 11·5 | 2·5 | 5·0 | 67·7 | 3·3 |
| Japanese Millet .. .. | 10·0 | 11·0 | 1·7 | 8·0 | 65·1 | 4·2 |

* Analysis represents the average value for two or more samples.
** Analyses are expressed in terms of the average moisture content of 10 per cent.

The feeding value of the five varieties of millet has been compared by Dr. J. M. Harvey, Biochemist at the Animal Research Institute, Yeerongpilly.

His report is as follows:—

"Protein: All types show only minor differences in protein content. Similar small differences have been noted between samples of the same type grown in different localities. This suggests that variations in protein content may be related to soil fertility and climate, rather than to the type of millet.

"Fat: The crude fat content tends to be lowest in Japanese millet and highest in the Giant Setaria samples. However, as in the case of protein, a similar variation has been noted between samples of the same type grown in different localities.

"Fibre: All types show minor differences in crude fibre.

"Carbohydrate: Variations in the carbohydrate content are related largely to small differences in protein and fat.

"Ash: All types show only minor differences in ash content.

"On the basis of these analyses and from published data, it is concluded: 1. All varieties of millet have approximately the same feeding value. 2. Where differences in feed value exist, they are due to the influence of soil and climate and not variety. 3. It is essential that millet grains be finely ground for all classes of livestock other than birds. 4. The feeding value approximates that of the cereal grains—maize, wheat, barley and sorghum."

## Menace To Tobacco

MOSAIC can be a very serious disease in tobacco, especially when it affects plants in the seedbeds or in their early life in the field.

This disease is caused by a virus which enters the sap of the plant. Although the virus spreads to all parts of the plant, its affects are seen only in leaves which develop after the plant becomes affected. It causes a considerable loss in yield and quality of these leaves.

As the seedlings or young plants have most of their development to come, a larger number of leaves become affected and the loss is greater than when mosaic enters the plant later in its life.

Most of the infection occurs when plants are being handled, as at transplanting, early chipping cultivation or topping and suckering. It takes only a very small amount of the virus to spread the disease.

The main sources of infection are diseased plants or manufactured tobacco. Diseased plants are chiefly responsible for the spread of the disease during the late stages of growth. Manufactured tobacco is the greater danger in the early stages.

It is often said that certain farmers always smoke when they are handling their seedlings at transplanting, and that they have no more trouble with the disease than other growers have. If that is so, there can be only one reason why they have escaped the disease. It was simply not present in the tobacco they were smoking at that particular time. However, there is every possibility that sooner or later they will infect their seedlings and their loss will be heavy.

Before handling tobacco plants, every worker, and especially the smokers, should thoroughly wash their hands with soap in running water. To place the water in a dish is not satisfactory as the virus washed off one worker's hands can be picked up on another's hands, and so be brought to the seedbeds.

*—E. J. McDONALD,*
*Adviser in Tobacco Culture.*

# Our Best Fodder Trees

By S. L. EVERIST, Government Botanist.

**Every farmer and grazier knows that in a dry time, trees and shrubs remain leafy and green long after the grass is dry and useless. The question is often asked, "Are these trees any good for fodder and if they are, which ones are the best?"**

It is known that some trees are eaten more readily than others and some are more nutritious than others, but, so far as you personally are concerned, the best trees for fodder are the ones in your own paddock, provided the animals will eat them and they are not poisonous.

Fodder trees are more important in western areas than they are in coastal districts because the growing season in the west is shorter and the dry periods longer. For this reason, most of the fodder trees that have been studied are western species. Out of a list of more than 100 different kinds of native trees which are cut for fodder or are grazed by animals in the paddock, we have space to consider only a few.

## Mulga Most Important.

The most important fodder tree in Queensland is *mulga*. It is not by any means the best, but it is important because it is plentiful, it grows in dense stands over large areas and it lends itself to cutting and mechanical harvesting on a large scale. There are many forms of mulga, some of them palatable, some not. We have quite a lot of information on its value as stock feed and how to use it without losing it. This information was summarized in an article in the June issue of *Queensland Agricultural Journal*.

*Wilga* is more widespread and more nutritious than mulga, but it does not form dense scrubs and does not lend itself to the use of machinery for harvesting. Its palatability varies too, so much so that you can easily start an argument on the subject in most districts. Some trees are eaten, some not. Generally speaking, *Tree Wilga*, a small tree with a short trunk and a spreading crown, is regarded as most useful and *Lavender Bush*, a shrubby form with no well-defined trunk, is looked upon as virtually useless. However, just to confound the experts, sheep and cattle will eat some wilga of the lavender bush type and refuse to touch some trees that look like good tree wilga. So far, neither chemist nor botanist has been able to find any reliable way of distinguishing with certainty between the trees the animals will eat and those they will not. Digestibility trials have shown that wilga leaves are equivalent in food value to good quality hay and are much better than mulga.

*Vinetree* or *supple-jack* is one of the best fodder trees we have. Beginning life as a slender vine, it eventually grows up into a shapely tree producing lots of palatable green leaves readily eaten by all kinds of stock. It is widespread in western districts but not usually in very great quantity, so that trees should be lopped, not chopped down.

*Kurrajong* is a handsome tree common in western Queensland and New South Wales and in some places extending almost to the coast. It is eaten readily by sheep and cattle and if it is lopped fairly high, grows again very rapidly. It has a good reputation as a fodder tree and is often mixed with other scrub.

### Bottle Trees Being Lost.

*Bottle trees* are fairly well known for their curious swollen trunks. Inside these swollen trunks is a mass of soft tissue, rich in carbohydrate, which cattle eat with relish. In many districts it is customary to chop down the bottle trees during a drought, split them or take off a piece of bark and let cattle eat the lot. Naturally, the trees are destroyed in the process and unless more young trees are planted soon, this practice cannot be continued for much longer. The use of heavy machinery to pull down brigalow scrub is also wiping out large numbers of bottle trees that we can ill afford to lose.

*Whitewood* and *Boonaree* are useful trees. Sheep are fond of them and under normal conditions can eat them for an indefinite period without any ill effects. However, the young leaves of boonaree yield prussic acid and can be dangerous to hungry sheep. The few big "smashes" that have occurred have been in poor, travelling sheep fed with large amounts of boonaree after a long period of starvation.

### Along the Coast.

In coastal districts the chief trees used for fodder are *Red Ash, Brown Kurrajong* and *Figs* of various kinds.

Red ash, sometimes known as *Soap Tree,* is conspicuous because the leaves are glossy green on top and almost white underneath so that when the wind blows the trees present an ever-changing pattern of green and white. The leaves are eaten readily by all stock, even horses.

Brown Kurrajong does not look much like the western kurrajong. It is a spreading tree with broad, toothed leaves and bunches of white flowers which are followed by burry fruits. It is particularly common in old scrub country and along the edges of moist gullies. Cattle are very fond of it and regrowth after lopping is rapid.

Nearly all fig trees are eaten readily by stock. The native ones most commonly available to cattle are the *Sandpaper figs* and the *Moreton bay figs.* The larger fig trees are often planted for shade around farms.

Apart from native trees, there are many introduced species which can be planted for fodder. There is a place for fodder trees on nearly every farm and grazing property. When we have trees we should learn to use them without destroying them. When we have none, it's often worthwhile to plant some. If you want more information about fodder trees do not hesitate to write and ask for it.

## *This Actually Happened*

A farmer was rolling a stony paddock and had his small daughter sitting beside him. The farmer had his attention distracted for a few moments. When he next looked beside him he noticed that the girl had disappeared. He looked back and saw the little girl lying on the ground behind the roller. It had passed over her, causing instant death.

Keep children off tractors.

# A Letter from BALLYRANDOO

My dear Son,—

During the past week we cleaned out the silt tanks at two of the excavated tanks, and used the scooped dirt to fill up some of the trodden-down dips in the bywash banks. Whilst we had the tractor and scoops at the dams we also built up the approaches around all the troughs to a width of four feet or so, first laying down a corduroy of bush logs and then covering this over with dirt scooped away from the drain-away ends of the troughs. These trough approaches had become very hollowed out by sheep watering. Now that they are built up to within a few inches of the lips of the troughs, sheep, particularly lambs, are able to drink more easily, and the build up will also help to protect the under sides of the troughing from damage by horns of cattle and hooves of stock.

With lambing approaching I have been concerned about the number of foxes about, so for several nights we have been doing spot-lighting tours in the Land Rover. Where you might see a couple of foxes in a week in daytime, I was astounded to find them wandering in considerable numbers during night hours. It is easy to recognise foxes at night in the light of the spotlight, foxes eyes gleam red, and sheep's eyes show green. We took both the shotgun and .303 rifles on these night shoots. I found when using the rifle that it was necessary on spotting a fox to jump out and stand between the headlights of the Land Rover, facing towards the fox. When you do that the headlights show up the sights clearly, otherwise it is impossible to aim properly. We were only able to use the shotgun for close-up shots, but this was fairly often, for the foxes seem more curious than timid at night, and will sometimes stop and watch the lights until you are quite close to them. In three night trips we accounted for 12 foxes. I told the neighbours how many foxes we were getting and it seems they are eager to join in the sport for on last night's trip we saw vehicle lights flashing several times on the boundaries and heard a number of shots fired. We also shot an occasional kangaroo and wired the carcasses to rabbit traps. Twice by the following day we accounted for up to two foxes on the one carcass in this manner. Of course you get an occasional wild cat in the trap instead of a fox. We have also been after the pigs pretty vigorously with rifle and poison, and have set up several netting crow traps around the run. So perhaps we may rear a lot more lambs this time as a result of this intensive campaign just before lambing. Affectionately, Dad.

# Cows Help Themselves To Silage

By A. HUTCHINGS, Senior Adviser in Cattle Husbandry.

**A method of supplying silage daily to the dairy herd while avoiding the labour of stall feeding has been used by Mr. John Heyting, Manager of Stanley Plantations Pty. Ltd., Booval.**

Mr. Heyting's clamp silo is on level ground above flood or drainage water. It was formed by two wooden sides, 90 ft. long, about 4 ft. high and 24 ft. apart. These sides were sloped slightly to ensure compaction of silage and exclusion of air during settling. Lengths of 3 in. x 1½ in. hardwood timber were nailed to 4 in. x 2 in. uprights driven into the ground at 5 ft. spacings. Struts set at an angle to the ground provided the necessary support during filling and rolling. Old timber was used as a floor. All other timber was second class.

The silage was compressed between the sides of the clamp and given a raised centre and ends tapering to the ground. It was covered with tightly packed, baled, grassy hay.

A strong frame, roughly the shape of a ladder on its side was built to reach from side to side, being 3 ft. 6 in. high and raised above ground level. Uprights 3 in. x 1½ in. were

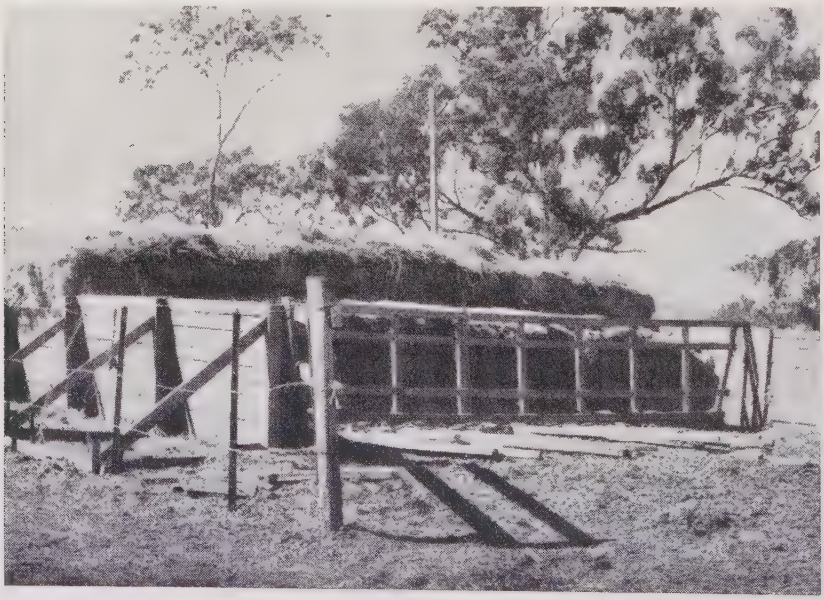


Plate 1.

**Clamp Silo, Showing "Ladder" Framework Which is Moved Forward as Cows Eat Away the Face of the Silage.**

Plate 2.

**Dehorned Cows Help Themselves to Silage, Saving the Labour of Stall Feeding.**

fixed at 2 ft. 3 in. spacings in the ladder, which was pegged to each side of the clamp.

The dehorned cows feed through the restraining ladder, being able to reach 4 ft. through the frame. The ladder is moved along the sides as the cows eat away the face of the silage. The bales of hay are removed progressively and fed to dry stock in a nearby paddock.

Before Mr. Heyting's cows used the silage self-feeder, they were in poor body condition and low production. Their condition soon improved, leading to an immediate increase of nearly half a gallon of milk from each cow per day.

It is stressed that the addition of a protein supplement to the silage ration is necessary for high production.

## *Avoid Seed Drill Failure*

Regular maintenance of your seed drill will greatly reduce the risk of mechanical breakdowns at the busy planting time.

Most parts of the drill need greasing or oiling once a day when in use. Disc-type furrow openers, however, must be greased at least twice a day. Follow the lubrication instructions in your owner's manual.

Before starting a seed drill, always make sure that the feed runs and fertilizer feed mechanisms are free. Every evening, clean the whole mechanism, especially the fertilizer feed mechanism where fertilizer builds up under the wheels and may cement them solidly to the bottom of the box. Never leave your seed drill in the paddock overnight, but always take it to the shed and clean it.

*—C. G. WRAGGE, Agricultural Engineer.*

# Barn Hay Drying

By C. G. WRAGGE, Agricultural Engineer.

[CONTINUED FROM SEPTEMBER, 1958.]

THERE is no point at all in using heat for storage drying. Only where high output is required on a batch basis is heat justified. This point must be emphasised because it is commonly believed that satisfactory drying with unheated air is not possible because of high prevailing relative humidities and rainfall.

To refute this fallacy one has only to consider the number of unheated air driers that have been operating successfully for a number of years in localities with average summer relative humidity in excess of 80 per cent. and average annual rainfall of 56 inches.

To reduce drying times to increase the number of complete fillings in the season, the air can be heated some 8–10 deg. F. above the surrounding air temperature. The heat is only used during periods of high humidity, and also continuously during the last two or three days of the drying period.

A higher temperature rise than 10 deg. F. would only cause overdrying of the bottom layers. Heat used in this way increases the cost per ton of dried material two to three times. For example, in the case of electric heating, it requires an average of 50 kWh (50 units) to produce a ton of hay by the use of unheated air, whereas heating the air to accelerate the drying period or obtain a higher throughput would require 90 to 240 kWh per ton, depending on the type of crop being dried.

## Electric Heaters.

Where electric power is available, electric heaters are usually employed for relatively small drier installations such as barn hay driers. They are clean and automatically controlled, simple in construction, compact and easy to install. As mentioned earlier, they also have the advantage of being used as a portable "communal" heating unit for a multi-bay installation. (Plate 2). A heater of 18/25 kW would be required for a floor area of approximately 160 sq. ft.

## Oil Burners.

There are several types of burners suitable for the comparatively low temperatures required in agricultural drying equipment. The function of the burner is to split up the oil into a fine mist or spray to enable it to mix intimately with the air needed for combustion.

*Medium Pressure Air Burner.*—These types are fed with air for atomising purposes by a compressor, at a pressure of from 3 to 10 lb. per sq. in. With this type of burner only about 5 per cent. of the air required for combustion is used for atomisation purposes, and the balance is introduced through secondary air ports. It can be set to give low hourly rates of consumption, and is often used in the smaller drying installations. When suitably adjusted, however, it may also be employed satisfactorily in quite large plants.

*Low pressure Air Burner.*—These burners employ a fan to provide air for atomisation at a pressure of 15 to 25 in. W.G. Approximately 25 per cent. of the total air for combustion is required for atomising the fuel, and the remainder is admitted through secondary air ports in the same way as with the medium air pressure type.

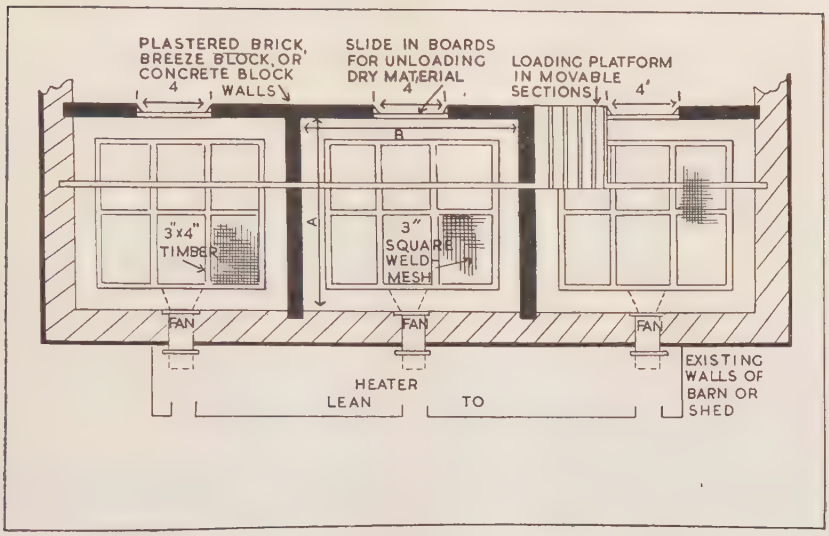



Plate 14.

**Plan of a Three-Bay Batch Hay Drier Employing the "Highlo" System of Drying and Built into One End of an Existing Building or Shed.** Dimensions "A" and "B" can vary from 10 ft. to 20 ft. depending on the size of the original building and output required.

*Other Types.*—These are occasionally found on farms. The Spinning Cup rotary type, where the spinner is driven by an electric motor which also drives a low pressure fan supplying the air for combustion is one type. There is also the Pressure Jet Burner which requires a high pressure to force the oil through a specially designed orifice, which breaks it up into a fine spray.

*Temperature Control of Oil Burners.*—Oil firing compared with solid fuel firing is particularly well suited to automatic methods of temperature control. With medium pressure air burner installations, control is of the high/low flame type. The temperature of the heated air is controlled by an air-leak thermostat located in the heated air stream, and connected to the burner oil-control valve. A further air-leak thermostat is located at a suitable point in the combustion chamber and connected to the main cut-off valve. In the event of a flame failure the oil supply to the burner is stopped immediately.

With low pressure air burners, the controls are also of the high/low type, but they are operated electrically. When the high pre-set temperature is reached the size of the flame is reduced; and when the temperature falls to the set low level the oil supply is automatically increased again. A flame failure device, usually of the bi-metal strip type, cuts off the supply of oil in the event of the flame becoming temporarily extinguished, by means of an electro-magnetically operated valve. With some low pressure air burners provision is also made to maintain the correct oil/air ratio by closing the secondary air register when the burner is cut down to low flame, and opening it up again on high flame.

## Highlo Process.

The Cold Blow/Hot Blow or Highlo Process of Drying is a recent development resulting from valuable work carried out by the United Kingdom Electrical Research Association under the direction of P. G. Finn-Kelcey. It has brought the barn hay drying

process into the category of the more expensive grass drying processes which eliminate the wilting period. It is of particular appeal to those farmers whose aim is to conserve a crop at a young stage when protein and starch equivalent are high and fibre low. It is ideally suited for working in conjunction with silage making on the larger farms, or as an alternative to silage on the smaller farm.

The principle of operation is to use more than twice the volume of air (that is, approximately 55 C.F.M./ sq. ft. of floor area) used for barn hay drying, and to use batches of only 5-8 ft. deep instead of 14 ft. or more. The process is then finished with a much reduced volume of air warmed to 15-25 deg. F. above the surrounding temperature.

In difficult wilting conditions, the crop can be safely loaded into the drier at a moisture content as high as 60 to 70 per cent. compared with the normal barn hay drying method (30-50 per cent.). This means that cutting and loading can frequently take place on the same day.

Any of the barn hay drying designs can be used for this process. An arrangement with three small bays each of about 150 sq. ft. (Plates 14 and 15) could be built into one end of an existing building. A similar arrangement could also be used if a suitable site is available for a drier to be built into a hillside (Plate 16) so that loading the installation through the doors is downhill work and the overhead loading platform could then be eliminated. Unloading of the dried material would be from the doors on the other side of the building.

The operation of the drier is normally as follows:—

*First day.*—1-1½ acres are cut and tedded.

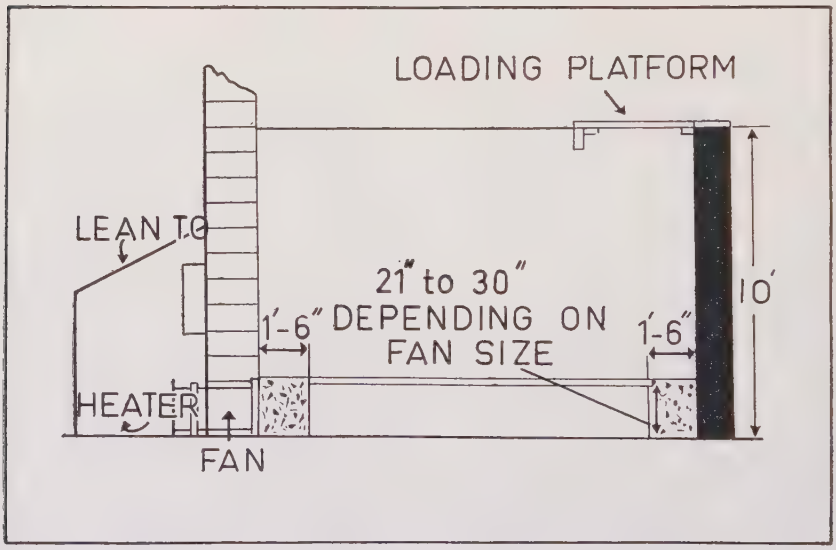



Plate 15.

**A Sectional End View of One Bay of a Multi-Bay Batch Hay Drier Showing Existing Wall of Original Shed.**

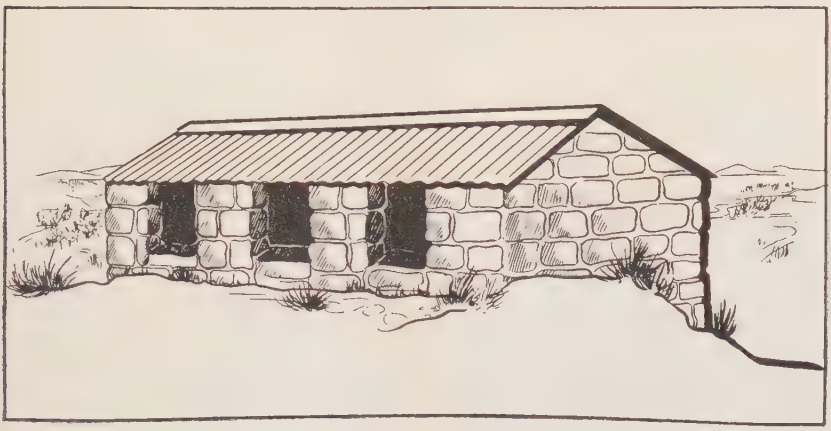


Plate 16.

**Sketch of a Three-Bay Hay Drier Built into a Hillside so that Loading the Installation is "Downhill" Work and Eliminates the Use of an Overhead Loading Platform.** The unloading doors are on the opposite side of the building.

*Second day.*—The first day's cut is carted and loaded into bay 1 and a further 1-1½ acres are cut and tedded. The two-stage axial fan with a separate motor for each stage is started up with both impellers in operation and delivering unheated air continuously.

*Third day.*—Bay 2 is similarly loaded and its fan run to blow unheated air.

*Fourth day.*—Same procedure adopted for bay 3.

After 48 hours of continuous unheated air ventilation, one stage of the fan in bay 1 is switched off and the portable electric heater of 18/25 kW is bolted to the fan housing and the heat is switched on. After 24 hours' running with heated air, the material is dry, and is unloaded for baling by the stationary baler. The cycle is then repeated, each bay being ventilated for two days with unheated air and one day with warm air. In this way some 7-8 tons of first quality hay is produced per 6-day week. Bagged grain can also be dried without any modification to the drier.

The operational costs for fan power and heat will depend on the amount of wilting given to the crop before loading. Consumption of power can vary from 240 kWh (240 units) to 420 kWh.

## Baled Hay Drying.

Results so far achieved in the barn hay drying of baled hay seem to indicate that, where every attention is paid to field treatment between cutting and baling at even moisture content of 45 per cent. or below, there is no limit to the amount that could be handled with an adequate layout.

Present experience would seem to indicate that six layers deep on edge is about the correct loading for the average installation, but with higher air velocities it should be possible to dry in storage as with loose hay.

When drying on a batch system an 8-10 deg. F. air temperature rise will no doubt prove advantageous in maintaining a steadier programme of throughput. Provided the floor is flat, floor arrangements can be much the same as those for loose hay drying.

## Conclusion.

To guide those interested in the installation of a drier the following suggestions are made:—

(1) If the requirement is a large quantity of high quality hay in a short season, then the answer is to convert as large a floor area or as great a number of bays as possible to the unheated air system with the intention of filling and leaving. Such

an arrangement is lowest in labour requirement and machinery, but higher in building costs.

(2) Where dried material is required from a steady succesion of cuts, integrated with strip grazing throughout a long season, then the "Highlo" system utilizing a smaller floor area is more practicable. This system is lowest in building costs but higher in operating costs and a stationary baler is desirable.

There will, or course, be cases for a compromise between the two systems, such as batch hay drying, particularly the drying of baled hay.

Whichever system is chosen, the value of the final product justifies attention to the following details:—

(1) Construction features should include smooth walls, flush fitting doors and minimum air leaks. If corrugated sheeting is used the sheets should be fixed horizontally to the inside of posts and frame to minimise air leaks. Temporary panels for doorways can be of ½ in. thick bondwood fitted on to the inside of door posts so as to present a flat surface on the inner face, flush with the inside of the walls. This eliminates any sharp corners that would form a "chimney" for the leakage of air. For the same reason the inside corners of the drying room should be well rounded to obtain an even packing of the crop.

(2) Correct type and size of fan for the particular installation.

(3) To shorten the wilting period and to speed wilting, tedding from cutting to loading is important for maximum throughput and minimum running costs. This factor cannot be over-emphasised.

(4) Even spreading from the loading platform into the drier is vital for even drying. With the "Highlo" process reduce the moisture content to 30–35 per cent. with "high–cold" blow. (See 5.)

(5) Be guided by the following recommended air volumes:

(*a*) Barn Hay Drying Loose Hay—20–25 C.F.M./sq. ft. at 1·5 in. W.G.

(*b*) Barn Hay Drying Baled Hay—35 C.F.M./sq. ft. at 2 in. W.G.

(*c*) Cold blow stage of C.B./H.B. process—55 C.F.M./sq. ft. at 2 in. W.G.

(*d*) Hot blow stage of C.B./H.B. process—15–20 C.F.M./sq. ft. at 5 in. W.G.

Good management of either system is the key to success.

### References.

"Crop Drying, Barn and Storage Machinery," by J. A. C. Gibb, M.A., M.Sc.

"Power Farmer Britain and Overseas," Vol. 15, No. 6.

"Practical Power Farming," Vol. 18, No. 3.

"Farm Mechanisation," Vol. VII., No. 73, and Vol. VIII., No. 81.

[CONCLUDED.]

## *What Is A Winter Wheat?*

A "winter" wheat differs from a "spring" wheat (the normal type grown in Queensland) in that the "winter" wheat must go through a period of low temperature before it is able to pass from the vegetative to the reproductive phase, that is from the production of leaf to the production of flowers and grain.

The practical importance of this difference is that a "winter" variety can be sown very early without fear of it running up to head and being frosted. Such a variety remains in the leafy stage providing good grazing till near the end of winter when it will come away and produce grain if the season is not too dry.

# Danger in Feeding Linseed

**At the time of linseed harvesting during the drought many sudden deaths in animals due to linseed poisoning were seen. Other less severe cases showed abdominal pain, rapid breathing and lassitude.**

The cyanide source is in the husks and seeds. It is the same poison as in Sudan grass and young sorghum. So regard linseed screenings as potentially dangerous always.

Don't feed them to hungry, empty stock. Don't wet them. If you're feeding them in troughs, dilute well with other bulk feed and always have hypo handy.

Hypo is a specific antidote for this poison. Give cattle and horses two ounces in water, sheep half an ounce. It acts quickly. If necessary the drench may be repeated in an hour. Only recently a farmer fed linseed in the bails and within half an hour found seven dead and several ill. He rushed to give the sick animals hypo and in another half hour they had all recovered.

Cattle can be drenched in an emergency with a bottle. Be careful doing it. Watch the following points:

1. Keep the head as near level as possible;

2. Pour the drench in small amounts into the side of the mouth;

3. Don't block the nose or rub the throat. —*R. MILLAR, Veterinary Officer.*

## Wind and Fire Dangers

The last three months of the year are notoriously windy in western Queensland sheep areas and the wise grazier will be checking his windmills and roofs against wind damage.

Loose nuts and bolts, slack stays and inadequate oiling could leave you with the ruins of a windmill, causing a sudden stock water shortage. A day with a spanner and tool kit now will reduce this danger.

There are few bushmen who have not seen a sudden squall catch a roof and scatter the corrugated iron. A day with a hammer and a packet of lead head nails will tighten corrugated iron sheets loosened through the long months, and replace missing nails, on homestead, woolshed, and outbuildings.

Wind can also combine with fire to create sudden terror and loss. Complete your fire ploughing programme and check your fire fighting equipment in good time to face the end-of-year seasonal fire danger.

—*R. B. YOUNG, Senior Adviser, Sheep and Wool.*

# Inoculate Legumes for Free Nitrogen

By G. D. Bowen, formerly Plant Pathology Branch.

Most farmers recognise the value of legumes, such as clovers, lucerne, medics and cowpeas, as high protein pasture components or as nitrogen-rich green manure. Legumes owe their reputation in this regard to the almost unique ability to obtain their own nitrogen *from the air,* provided certain soil bacteria grow in association with them.

These particular bacteria (called legume bacteria—or Rhizobium) can be supplied at planting so that the farmer can make sure they are present.

Many failures to establish legumes in pastures and, in other instances, failure to make vigorous growth and produce high protein feed, need not have occurred had care been taken to provide correct bacteria for the plant growth.

The legume bacteria enter the plant roots and form nodules on the sides of the roots. These nodules are firm, fleshy growths either round or elongated in shape, and it is in these that nitrogen is fixed for the plant's use (Plate 1).

## Specific Action.

Careful scientific investigation has shown that for any one kind of legume only a limited number of the many strains of nodule-forming bacteria are efficient suppliers of nitrogen.

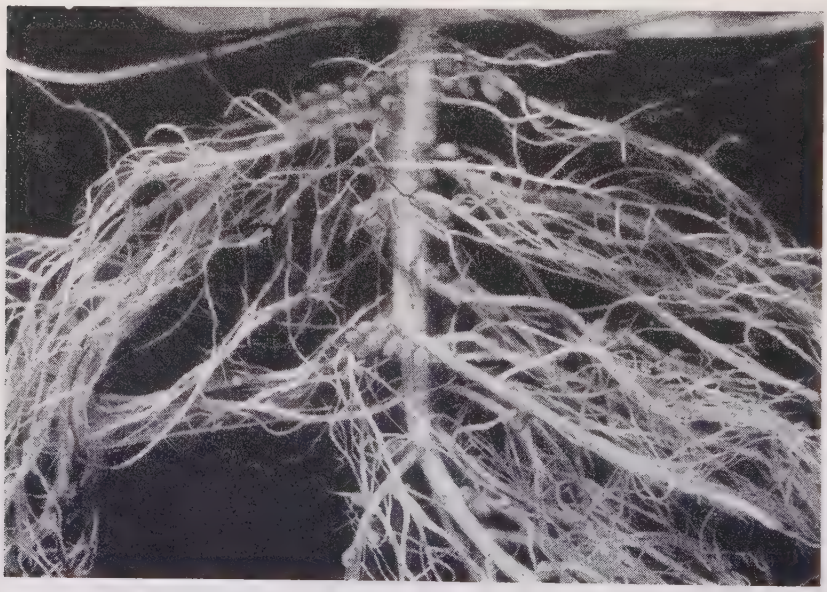


Plate 1.

**Bacterial Nodules of Subterranean Clover.**

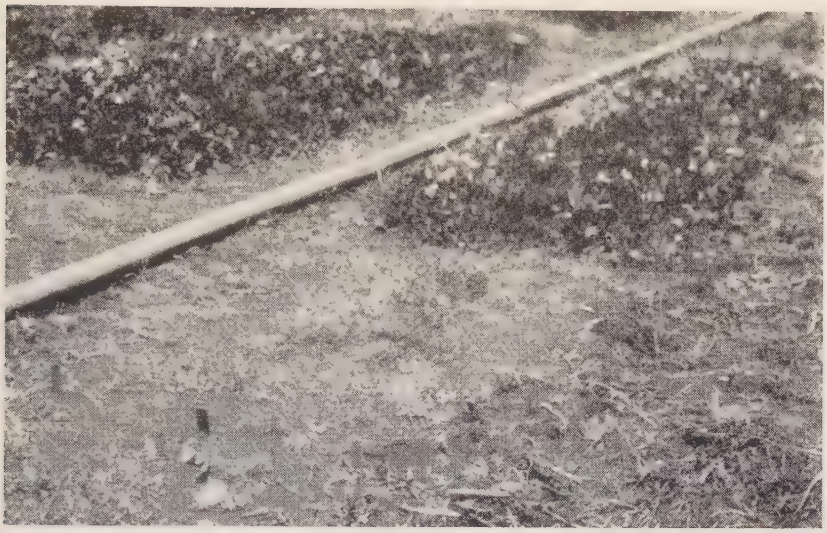


Plate 2.

**Legume Bacteria Under Trial on a Red and White Clover Mixture.** Uninoculated plots in foreground, plots inoculated with different bacterial strains in background.

In other words, different legumes require different strains of bacteria for most satisfactory growth.

Thus a strain of bacteria which is highly successful with white clover may form nodules on subterranean clover but will probably be quite unsuitable for fixing nitrogen. Bacteria that form nodules on one legume may not form nodules on other legumes.

These difficulties can be overcome by selecting very highly efficient bacteria for each of the commonly used legumes. This has, in fact, been done by the Department for a number of years, and this selection and testing for the best strains is still going on with newer as well as older legumes, with bacteria isolated locally, and with those imported from overseas.

## Supply of Inoculum.

The best bacterium for each legume species is available to the farmer, who can easily apply it to the seed (inoculation). The Department supplies this inoculum free to farmers when notified of the types of seed and the quantities of each to be planted. Supplies are held at Department offices in Brisbane, Toowoomba, Warwick, Gympie, Cooroy, Kingaroy and Atherton. Inoculum is air-mailed from Brisbane to the more northerly parts of the State.

It is wise, particularly where large quantities are required or when many others can be expected to be planting also, to order inoculum some days in advance. The inoculum can be safely used five weeks after receipt.

## Inoculating Procedure.

Easy-to-follow directions are enclosed with the inoculum. In brief the procedure involves washing the bacteria off the jelly-like substance on which they are growing, wetting the seed with the washings and allowing it to dry in a shady place.

The bacteria are sensitive living things and must be treated as such. The inoculated seed must be dried in the shade and planted as soon as possible after inoculation—preferably within hours—into a good, moist seedbed.

The inoculated seed must not come into actual contact with superphosphate. This fertilizer is particularly harmful because of its high acidity. To overcome this, basic superphosphate may be substituted or more usually, the acidity is neutralized by addition of an equal weight of lime to the superphosphate. This should be mixed some weeks before use and turned frequently. Instead of a 50–50 lime-super mixture, 1 part of burnt lime to 7 of super or 1 part of freshly slaked lime to 5 of super may be used but a near neutral mixture by these methods is often hard to produce. Less satisfactorily, seed may be sown from a separately attached box so that it enters the ground at the same time as the fertilizer. Failing this, the fertilizer should be applied separately a few days before planting.

### Other Considerations.

Since the bacteria enable the plant to use atmospheric nitrogen the greatest benefit will be obtained on nitrogen-deficient soils. In such soils, and where no bacteria for the particular legume occur, inoculation can mean the difference between success and failure in establishment. Many farmers in new pasture areas in Queensland's nitrogen deficient coastal soils will testify to this.

Where soil nitrogen is high, or some bacteria for the legume occur naturally (remember these are often only poorly efficient) responses may not be spectacular, but, depending on the particular conditions, small but significant effects will be obtained.

It must be remembered that the bacteria can supply only nitrogen. Therefore, do not expect good legume growth if plant nutrient deficiencies other than nitrogen are not corrected by application of fertilizers.

In some soils nutrient deficiencies or water shortages need to be overcome in addition to supplying inoculum.

## Farmers' Questions

American brome grass and Madrid sweet clover are the subjects of an inquiry from Tolga.

*Answer*: In Queeensland two types of American brome grass are grown. These are, annual prairie grass and perennial prairie grass. Both are grown on the Atherton Tableland.

Madrid sweet clover is not grown in Australia. However, in the southern States a common form called *Melilotus* is grown to some extent. This type is a serious source of milk tainting as in fact are all *Melilotus* species. Consequently it is better not to be used for grazing of milk stock.

"R.B." of Bowen has inquired about the suitability of spear grass for hay production.

*Answer*: It is generally considered that pure stands of spear grass are not particularly good for hay production. In a native pasture mixture however, a small percentage of spear grass is permissible. This will not spoil the quality of hay produced, provided the mixture is cut in the very early flowering stage of the spear grass. Spear grass loses protein content rapidly after flowering and at the same time there is a considerable increase in the crude fibre percentage.

# Lucerne Pests and Their Control

By G. H. S. HOOPER, Assistant Entomologist.

**Lucerne is grown in Queensland mainly for fodder, a small acreage only being devoted to seed production. Though many insects attack both types of crop, only a few are of sufficient economic importance to warrant control measures.**

The vigorous, quick growth of irrigated stands largely offsets the ill-effects of insect attack which, however, may be quite pronounced in rain-grown crops in the same district. To ensure yields during periods of major pest activity, some attention to pest control, whether by cultural or chemical means, may be required in both irrigated and rain-grown lucerne.

Chemical controls are not warranted as a farm routine, and their use during periods of major pest activity should be considered with due regard to the market demand for fodder, and the expected yield under prevailing weather conditions.

## PESTS OF FODDER CROPS.

The major pests are *cutworms, jassids* and *lucerne leaf roller. Cutworms* are troublesome in both seedling and established crops. These are brown, soft-bodied grubs about 1½ in. long when full grown, which shelter within the soil during the day, emerging to feed at night. Seedling crops may be attacked in February-April and if the infestation is severe, replanting is generally necessary. Established crops may be attacked in July-August, November and February-March, when severe defoliation and stalk loss can result.

Several species of jassids or leaf hoppers attack lucerne. These are small, green, sap-sucking insects, ⅛ in. in length. They fly quickly when disturbed and give the impression of hopping, hence the name leaf hoppers. Jassids feed and breed on the foliage, and feeding sites show as a fine, white stippling in the green tissues. Severe infestations result in plant stunting and leaf fall occurs. Dry conditions accentuate this damage. These pests, though present in lucerne at all times of the year, are more abundant in the late summer and autumn, especially following good summer rains.

*Lucerne leaf roller,* the larva of a small moth, webs the terminal leaves together and feeds on the tissues. When infestation is severe, considerable defoliation results. The larvae which shelter within the webbed leaves, are green with black heads and approximate to ½ in. in length. This pest may be found in lucerne throughout the year, but is more prevalent in spring and early summer. In some years, however, it may assume importance in the autumn.

*The lucerne looper* though usually of only incidental importance, may appear in plague numbers in some years. It is a brown caterpillar about 1 in. in length.

In old lucerne stands, larvae of *crown borers* may cause the death of isolated plants by tunnelling and feeding within the crown, and such stands should be ploughed out. The adults are small longicorn beetles ½ in. in length.

The green slug-like larvae of the *grass blue butterfly* feed on lucerne foliage. These butterflies may be seen flying over flowering crops, and although often present in large numbers, damage by their larvae is not of economic importance.

Plate 1.
**Lucerne Infested by Leaf Roller.**

*Red spider mites* are only of occasional importance in rain-grown crops. Their feeding causes a greying and wilting of the leaves and terminals.

## PESTS OF SEED CROPS.

Lucerne grown for seed may be attacked by the pests in fodder crops and also by insects which feed on the flowers and developing seed heads.

*Heliothis* moths may be prevalent in late spring and early summer. The larvae feed on the buds, flowers and developing seed, and less frequently on foliage.

The small black *lucerne seed wasp* may be prevalent during the post-flowering period. Eggs are laid in the maturing seed, which are eaten out by the developing larvae. This pest is rarely of economic importance.

Several sap-sucking bugs including the *green vegetable bug* and other *shield bugs, rutherglen bugs, nabid* and *mirid bugs* feed on the developing seed, causing distortion and wilting of young pods, and checking seed development.

*Thrips* are occasionally responsible for faulty seed setting. These are small, blackish winged insects which live and feed within the flowers.

## CONTROLS.

The activities of major pests seldom coincide in particular fields and consequently the control for each should be considered separately.

*Cutworm* infestations in seedling or established lucerne cannot be foreseen. Weed growth on headlands, in fallowed land, and even within crops, may encourage egg laying, and these sources of infestations should be eliminated at least a month before planting. At the first sign of cutworm activity, the crop should be sprayed with DDT at the rate of ½ lb. active ingredients per acre. One treatment is usually sufficient.

*Jassids* are controlled readily by spraying with DDT at the rate of 1 lb. active ingredient per acre, about two or three weeks after each cutting. The benefits which might be obtained from spraying even when high jassid numbers are present must be viewed in the light of prevailing soil moisture, production economics, and possible weed development. In rain-grown crops lacking adequate soil moisture, little benefit may be obtained; with irrigated crops, the value of the expected returns may not be realised in a season of over supplied markets.

The possibility, however, of weed establishment and development at times when the vigour of the lucerne is seriously retarded should not be overlooked.

The *lucerne leaf roller* is controlled efficaciously by spraying either with commercial DDD (TDE) at the rate of 1 lb. per acre, or DDD (½ lb. per acre) and white oil (1 part to 100 of spray). As the damage from this pest is often not of serious consequence until late in the life of each cutting, earlier harvesting of irrigated crops should be considered. With rain-grown crops, should growth be slow, grazing or mowing and removing the infested lucerne will check an infestation.

Should the *lucerne looper* be present in large numbers, DDT applied at the rate of ½ lb. of active ingredient per acre, will prevent further damage.

Damage by *Heliothis* to seed crops can be prevented by spraying with DDT (1 lb. per acre) just after intensive moth activity, or at the first sign of larval infestation. Similar treatment will check damage to fodder crops.

When the *lucerne seed wasp* is troublesome, harvesting the crop before the late formed pods are mature will ensure good quality seed reasonably free of damage.

*Thrips* and plant-sucking bugs are controlled by spraying with DDT at the rate of 1 lb. active ingredient per acre.

Early cutting or grazing is recommended when *red spider mites* present a problem.

Boom spraying is the most effective means of applying insecticides in lucerne crops. To ensure adequate penetration and coverage, the volume of spray delivered should be not less than 15 gal. per acre.

As the chemicals recommended for the control of the major lucerne pests may have undesirable residues, these should not be applied within a week of either cutting or grazing.

**Scientific Names of Pests.**

| | |
|---|---|
| Cutworms | *Euxoa radians* (Gn.)<br>*Agrotis infusa* (Boisd.) |
| Jassids or leaf hoppers | *Austroasca viridigrisea* (Paoli)<br>*Austroasca alfalfa* (Evans)<br>*Austroagallia torrida* Evans |
| Lucerne leaf roller | *Tortrix divulsana* Walk. |
| Lucerne looper | *Zermizinga indocilisaria* Walk. |
| Crown borers | *Zygrita diva* Thoms.<br>*Corrhenes stigmatica* Pasc. |
| Grass blue butterfly | *Zizeeria labradus* (Godt.) |
| Red spider mites | *Tetranychus* species |
| Heliothis | *Heliothis punctigera* Wallengr.<br>*Heliothis armigera* (Hubn.) |
| Lucerne seed wasp | *Bruchophagus gibbus* Boh. |
| Green vegetable bug | *Nezara viridula* (L.) |
| Shield bugs | *Cuspicona thoracica* Westw.<br>*Piezodorus rubrofasciatus* F. |
| Rutherglen bugs | *Nysius vinitor* Bergr.<br>*Nysius clevelandensis* Evans |
| Nabid bug | *Nabis capsiformis* Germ. |
| Mirid bug | *Megacoelum modestum* Dist. |
| Thrips | *Thrips tabaci* Lind. |

# *Farm Wisdom*

ONE of the best securities a dairy farmer could take on, is the irrigated *Phalaris tuberosa*—rye grass-clover mixture. It provides excellent fodder during autumn, winter and spring. It is thankful for regular waterings, and shows at the same time a remarkable hardiness to neglect. I have seen it survive a six months dry spell, when the water supply was cut out by a drought. But we will see how it performs under good management. It easily carries two and one-half cows to the acre for day grazing and this number could be increased to seven if we allow the animals two hours grazing per day. This means that a relatively small area of 10 acres flood irrigated pastures could carry a more than average herd. If, in addition, hay and grain are in ample supply, dairying conditions could be called ideal.

If both water supply and soil condition are favourable, flood irrigation is the most attractive form of irrigation. It is relatively cheap and simple to practise. It does away with toil and leaves the farmer with much time to spare. Some practice has to be gained, but common sense and alertness are the main requirements. Pastures, like other plants, need some leaf area to enable them to produce the necessary plant foods. Grazing therefore should be controlled. Continuous grazing will deplete the soil of its fertility, unless we take certain precautions. Far more important than putting on fertilizers is spreading the animal manure immediately after the cows have left their grazing strip. A cheap and practical gadget to do this can be made out of some car tyres cut in halves lengthways and tied to the tractor, with their open sides down. The pastures and clover plants are not damaged and the manure spreading is quite effective. It has been claimed that with the urine and the manure, the nitrogen poured out onto the soil by grazing animals was equivalent to a ton and a quarter of sulphate of ammonia per acre per year. The potassium was equivalent to about 12 cwt. of muriate of potash, the phosphorus to about 7 cwt. of superphosphate and the calcium to about 5 cwt. of lime.

These figures were obtained on exceptionally good pastures in New Zealand and represent the maximum return of nutrients by grazing animals under ideal conditions. Maximum figures may be misleading, but high nutrient returns have been reported elsewhere:

Grazing two cows per acre continuously on pasture, the equivalent of 18·3 cwt. of sulphate of ammonia, 5 cwt. of superphosphate, and 5 cwt. of muriate of potash was returned per acre per year.

Under Queensland conditions where irrigated pastures are seldom grazed continuously, such high yields cannot be expected. Nevertheless properly used manure and urine can be important in maintaining pasture productivity.

As mentioned before, controlled grazing is a necessity. An occasional top-mulching is also of great importance. It not only brings down evaporation losses, but also improves the soil structure. Very light, or no grazing during the hot summer months, will prove to be beneficial. The pastures then will shade the more heat-sensitive clovers, thus creating a cool micro-climate.

And so, if we manage our flood irrigated pastures along these lines and we store supplementary fodder in sufficient quantities, we will have robbed drought of its sting.

*—L. E. BRANDS, Adviser in Agriculture.*

SOME 20 miles west of Tara, Mr. Dick Eley, of "Heanor," in the Gums district, found in his present 44 acres of green panic pasture a way to greater prosperity and one of the best drought tonics in a lifetime. He is so convinced that he aims for 175 acres in the near future.

An irrigation grower and a keen water conservationist, Mr. Eley had been irrigating 14 acres of lucerne from approximately 13,000,000 gal. storage tanks. The drought then struck and with the lack of good replenishing rains he was forced to discontinue irrigating as late as last September. This was to ensure supplies for stock and domestic purposes.

His rain-grown green panic pastures on the other hand only faltered when the soil was dry. With each shower he had very rapid feed for his sheep. He had to flog it—it was the only feed he had. He said whenever he felt down in the dumps—a visit to his green panic pastures was a cheer-up tonic to him.

Not only are Mr. Eley's sheep on green panic, so are his neighbours'. So it looks as if the "green light" is on for green panic expansion on grey brown brigalow-belah soils of the Tara-Gums district.

Mr. Eley stresses the use of good seed and sowing approximately 3 to 4 lb./acre with ¾ lb. lucerne about 1 in. deep during the wetter summer months. His best results follow a 7 to 8 month fallow after a sudan crop. Though the green panic will compete with brigalow weeds—the less competition from weeds the better.

Mr. Eley said green panic will stand light frosts. Heavy frosts will cut top growth. With the advent of rain and the usual brief mild weather that follows—the green panic provides rich, palatable feed.

What impressed him most, said Mr. Eley, was its drought hardiness—the way it stood up to the long dry spin. From September on, a continuous heat wave was experienced. He said he had never known it to be so hot for such a long period. When he "sweltered" in discomfort, his green panic bloomed with each shower.

*—R. G. WILSON, Adviser in Agriculture.*

SILAGE made 22 years ago has convinced two Rosewood dairy farmers of the value of silage as a long-term drought reserve. A total of 90 tons of silage put away in 1936 answered the fodder needs of Messrs. A. W. Krause and V. Loveday during last year's drought. It opened up in perfect condition and the cows actually preferred it to other food, including lucerne hay and concentrates. These farmers plan to put down more silage and, between them, expect to have 450 tons in store this year.

Silage making in Queensland has gained new support since mechanical harvesting reduced the cost of putting it away. Put away in dry, airtight silos, it is almost indestructible and is an outstanding fodder reserve.

*—J. ARMITT, Dairy Officer.*

KEEP fodder cane in mind when you're planning measures to beat the next drought.

It's a crop you can count on to give you a lot of succulent roughage, and if you don't need it in one season it will stand over to the next. Under normal conditions, fodder cane will yield at least 30 tons to the acre. Under ideal conditions, this yield will be doubled.

Planting time is now at hand. In central Queensland you can plant fodder cane between July and December, and in north Queensland between April and December. In southern Queensland, it's best to plant between September and March.

The variety Co 301 is recommended for all districts in Queensland where the crop can be grown.

*—O. L. HASSELL,*
*Senior Adviser in Agriculture.*

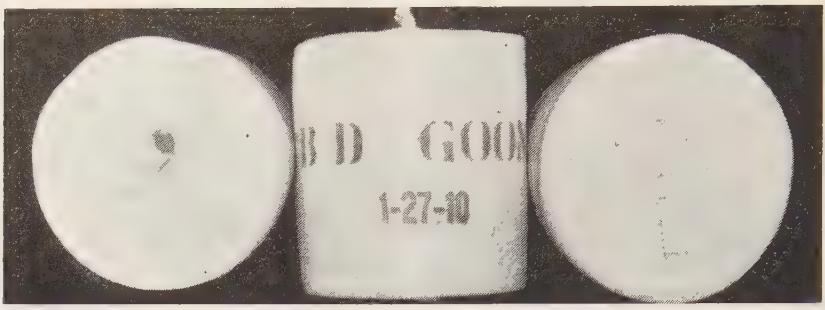



Plate 1.

**Rindless Cheese with New Type Covering Instead of Cheese Bandage.**

# More Variety in Dairy Foods

By E. B. RICE,
Director of Dairying.

**Production of a wide variety of dairy foods by our factories is needed to increase consumption and improve the economy of the dairy industry.**

Fewer varieties of dairy products are consumed by Queenslanders than by people in most other countries. In recent years though, there has been some widening of their tastes, particularly for cheese. Several varieties other than cheddar, both imported and locally-made, are now obtainable.

Greater diversification of the products of our dairy factories will help to bring about higher overall consumption rate on the more remunerative and stable local market. It will give flexibility for switching production to the most profitable products for export markets according to the demands and price fluctuations which occur from time to time.

The milk solids other than fat, due to their importance in human nutrition, are gaining increasing usage in

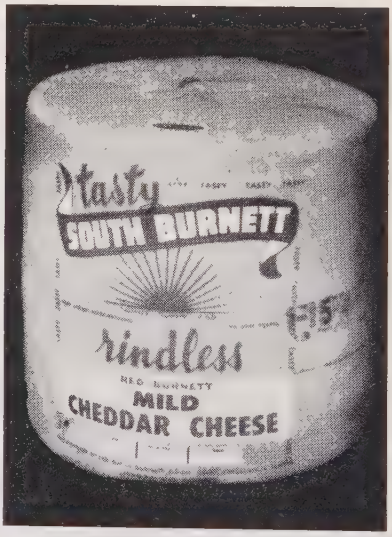



Plate 2.

**Modern, Attractive Presentation of Cheese.**

food products in some countries, especially U.S.A. The effective utilization of these constituents presents a challenge.

## Skim-milk Powder.

The non-fat milk product which offers the greatest scope for development in Queensland is skim-milk

powder. About 190,000,000 gallons of skim-milk produced yearly on farms is fed almost exclusively to farm animals. The two chief potential avenues for its diversion in powder form as a human foodstuff are the bread industry and South East Asian countries.

Skim-milk powder incorporated in bread improves the calcium (bone-forming) content, the crust, texture and keeping quality of the resultant loaf. It offers possibilities too in other foodstuffs and already is commonly used overseas in prepared soups, sausages and other dairy products.

South East Asian countries have inadequate milk supplies locally available, but the indigenous cattle produce milk of richer fat content than the breeds in highly developed countries. Some countries are already importing powder for "toning" milk. This consists of mixing the local milk supply with skim-milk prepared from the powder to bring the fat content of the milk distributed to a level comparable with normal milk of other countries. The fat, after all, represents only about one-third of the solids in milk and, nutritionally, the non-fat solids, which consist of first-class protein, minerals and some vitamins, are no less valuable than fat.

Interest is also being shown in Southern Asia in producing reconstituted or recombined milk for the populations in large cities. Butterfat and skim-milk powder mixed with water produce a milk scarcely distinguishable from normal milk.

Milk is not a cheap food in these countries. As the living standards of the people steadily rise, consumption will increase, because of the high priority it is given in national nutrition schemes, particularly in the Indian sub-continent, where the people are traditionally milk drinkers.

Queensland's potential for producing skim-milk powder and its proximity to South East Asia place our factories in a favourable position to explore and develop a market there for skim-milk powder and butterfat as the basic ingredients of reconstituted or "toned" milk.

Another interesting development should extend the use of skim-milk powder. By modifying the processing, a powder called instant milk, which quickly dissolves in water, has been evolved in the U.S.A. Its convenience to the housewife is leading to soaring sales in that country, and a similar rapid acceptance by Australian women seems a reasonable prediction.

## Eat More Cheese.

Cheddar cheese is made and consumed almost exclusively in English-speaking countries, although other varieties are also produced and consumed. Queenslanders eat about 6 lb. of cheese yearly per person, compared with the 14 to 18 lb. eaten by continental Europeans. The Swiss, 18 lb. per person, are the world's biggest cheese-eaters, while the French have the widest choice of varieties. The variety and quality of our diet would be improved by eating more cheese, and by including types other than cheddar.

The dairying industry must keep pace with the modern features of sales promotion and improved packaging and other relevant aspects in achieving the desired objective. The trend to consumer-size prepacked rindless cheese, covered with metal foil or transparent plastic-like material, is making strong headway in overseas countries and is evident in Queensland, where eight factories now package cheese of this kind. This method of presenting cheese to the consumer in attractive, handy-sized pieces should give a stimulus to cheese consumption.

The developing self-service and supermarket system of retail selling can also be expected to influence

consumption of dairy products. Better packaged products with eye-catching labels will stimulate impulse purchases and repeat sales, provided a high-quality product is within the wrapper.

Queenslanders drink less fresh milk than people in most other countries. We have a long way to go in lifting our rate of about 28 gallons per person yearly to equal the 48 gallons of the Swedes, who hold the world's record.

Not only will an increase in consumer milk be beneficial to the health of consumers, but it will also be to the economic well-being of dairy farmers, for the market milk trade is the most profitable and stable section of the industry.

Table cream is another product which offers much scope for increased consumption in this State, particularly if types suited to various purposes become available.

Diversification of dairy products will be to the advantage of the consuming public and the dairy industry itself in the full development of its resources.

## Rid Your Pigs Of Roundworms

PIGS carrying a heavy burden of the large roundworm are not likely to grow as profitably as worm-free pigs. They have to compete with the worms for available food supplies, and resist diseases arising through worm infestation.

To reduce infestation to a minimum, a seasonal programme of treatment should be followed. This consists of regular treatment of litters as they are weaned, repeated in four to six weeks if the pigs are very wormy at weaning. Pigs bought in should be isolated and treated before release into the piggery. In addition, breeding stock should be treated once or twice a year at strategic seasonal periods.

The ideal way is to pen pigs on concrete floors while being treated. Where this is not possible, take advantage of the weak point in the worm's life cycle, when the eggs are passed out onto the ground in the dung. These eggs require warm, moist conditions to develop. By treating pigs after the summer wet season, winter's cold dry conditions will prevent most eggs from developing, and reinfestation is light. By treating again in the dry spring weather, reinfestation will again be light during the hot, wet summer months. Weaners should be penned for treatment, and turned onto clean ground if possible.

Treatment will be more effective if favourable worm development spots are removed. Fill in old wallows and remove accumulated food rubbish such as maize or sorghum trash, and so on, and shift feeding troughs which are surrounded by fouled ground.

If you suspect there is a roundworm problem in your piggery, you should consult your district Veterinary Officer or Pig Branch Adviser for advice on the drug to use, and its method of administration.

—*T. ABELL,*
*Senior Adviser, Pig Branch.*

# Dairy Parade

ARE you getting good service from your milking machine rubberware? If you are not, have you reasoned out why? As you know, the frequent replacement of rubberware on milking machines is a costly business. But you can make it last longer by proper care and attention.

Rubber deteriorates quickly in the presence of moisture and light. However, the main cause of short life in machine rubbers is fat and grease. This will soak into the rubbers unless they are properly cleaned after each milking. To keep them free of grease you must use plenty of hot detergent water to which is added a wetting agent for cleansing purposes. After each cleaning leave rubbers hang to dry and aerate between milkings.

A method which has been used for many years by Mr. Arch Koltermann of Highfields has proved very successful in giving added life to rubbers. This is to boil them once a week in a strong caustic soda water to free them of fat and grease. A clean sugar bag must be used to protect any rubbers coming in contact with the hot metal of the copper.

Mr. Koltermann's method is this:

1. Strip down all rubbers (except inflations) from the milking machines.

2. Place them in a clean sugar bag.

3. Suspend the sugar bag full of rubbers in a copper of hot water.

4. Add two tablespoons of caustic soda to each four gallons of water in the copper.

5. Bring the water to boiling point and boil for 10 minutes.

6. Remove rubbers from copper and sugar bag and brush them inside and outside.

The boiling process has the effect of leaving a hard smooth surface on the rubber. This will help stop the penetration of grease.

Do not boil inflations as they will tend to lose their tension.

*—M. COCKBURN, Dairy Adviser.*

RESULTS from the herd breeding survey have shown that mating too soon after calving gives a low rate of conception. Heats during the first month after calving are of low fertility, and mating during this period places unnecessary demands on the herd sire.

Conception during the first two months after calving results in too many cows calving again within 11 months. Conception rates during the second month are often good. Although this is useful for bringing cows in earlier for seasonal or quota calvings it can also shift calvings from the desirable months.

| | Fertile Services. |
|---|---|
| First 3-weekly period .. | 31.5% |
| Second 3-weekly period .. | 53.7% |
| Third 3-weekly period .. | 57.1% |
| Fourth 3-weekly period .. | 56.7% |
| Fifth 3-weekly period .. | 56.4% |
| Sixth 3-weekly period .. | 56.5% |

Control bulls to avoid early conceptions.

*—A. McTACKETT, Husbandry Officer.*

THE addition of a chemical sterilizer to the water used for rinsing dairy equipment before milking greatly reduces contamination from bacteria.

This advantage makes the use of a chemical sterilizer worthwhile as a routine measure on every farm. It must be remembered, however, that a chemical sterilizer has no cleaning effect. Milking machines and other equipment must be physically clean before the sterilizer can do a good job.

Between milkings, dairy equipment usually picks up dust and bacteria from the air. A pre-milking rinse flushes out the dust and wets the equipment to prevent milk sticking and building up milkstone. A chemical sterilizer added to the rinse has the added advantage of destroying the bacteria. Be sure to remove all traces of the solution from milking equipment to prevent any adulteration.

*—L. T. FOSSEY, Dairy Officer.*

THE chief advantage in using the hot iron method of dehorning is that the calf suffers no bad after-effects and no after-care is needed.

Dehorning by this method is successful when the growing buds at the base of the horn button are destroyed: This is most effectively done when the calf is about 10 days old. Of course, there are variations in the development of calves, so that it is a good idea to examine them regularly from the age of one week.

Electrically-heated irons are available and these ensure a steady supply of heat under working conditions.

Old soldering irons can be adapted to make irons for heating in fires. It is handy to have two sizes. The part of the iron which is used on the horn consists of a ring of copper around a hollow centre. In use, the centre of the developing horn fits into the hollow of the iron and allows the ring to be applied to the horn base. A handle of insulated material, such as wood, is necessary.

Irons should be heated to a cherry colour and applied over the horn centre. On application, the iron should be twisted clockwise and anti-clockwise, to give firm contact around the horn base. It is essential that a copper-coloured ring be burned right around the base of the horn. You may make the mistake of using too little pressure or allowing insufficient time of application—experience is the best guide in this regard. The calf appears to suffer little pain after the first application of the iron, and you need not be afraid of burning a deeper ring.

Before starting, clip the hair away from around the horn bud. It is convenient to have someone hold the calf but the whole operation can be done by one man. If working alone, put the calf on the ground and straddle it. Hold the head securely over the knee with one hand while the other applies the iron.

The hot iron method has much to recommend it. The main inconvenience lies in having to do calves at a particular age. Calves born as little as a week from each other would probably have to be dehorned at different times. If you have a number of calves it is likely that the gouge dehorners will be more suitable.

*—W. F. MAWSON, Senior Adviser, Cattle Husbandry.*

CONFUSION at milking time can often be traced to milking machines that have got out of adjustment. Faulty vacuum and pulsation can cost you precious time at each milking through the cups falling off or the cows becoming restless.

All this can be avoided by regular milking machine maintenance and adjustment. Good maintenance will prevent major faults, but small variations in the adjustment of the machine can still creep in. To track these down you need to have the machine tested.

Agriculture Department Dairy Officers have the equipment to test milking machines and, if you ask, will test yours free of charge. After the test, the Dairy Officer will tell you what minor adjustments are necessary or whether you should have the machine serviced by a machinery firm.

*—J. D. ELRINGTON, Senior Adviser in Dairy Machinery.*

# Growth Rate of Heifers In Central Burnett

By J. J. SULLIVAN and F. S. LORD, Cattle Husbandry Branch.

*In this trial, Hereford heifers were matched against Hereford x Santa Gertrudis heifers.*

The age at which first mating of heifers takes place affects the rate of turn-off on a beef cattle property. Where age of first mating is controlled, heifers are usually mated to calve at three years of age under Queensland conditions. But, if breeder heifers could be mated to calve at two years, and could then successfully rear a calf, the turn-off on a breeding property would be substantially increased.

Where age of mating is not controlled, many heifers become pregnant before they have attained the required stage of development. In consequence, they produce undersize calves and are unable to rear them properly, while, in unfavourable seasons, many deaths occur in heifers mated too young.

The age at which heifers should be mated depends on the rate at which they grow. It is generally considered that if they attain a liveweight of approximately 600 lb. about 15 months of age, they can be mated at this stage.

The quantity and quality of feed supply available is a major factor determining the mating age at which heifers can be mated and now observations carried out at "Eidsvold" Station indicate that this age is also affected by differences between breeds of cattle.

## Trial Procedure.

At "Eidsvold" Station (the property of Messrs. Joyce and Joyce, in the Central Burnett), two groups of heifers were ear-tagged and weighed. The Hereford x Santa Gertrudis group was taken from a total of 31 head in the "No. 1 Cross-Breeding Herd." These were ear-tagged and weighed.

Simultaneously, 185 Hereford heifers were ear-tagged and weighed. From this number 22 individuals were selected, each one of a weight that would pair with an individual in the Hereford x Santa Gertrudis group. They were about 10 months old at weaning when the trial commenced on September 5, 1957. Observations were continued until March 13, 1958—a period of 189 days.

Both groups were placed in the herd, with which they remained throughout the trial period. This ensured that they had access to the same feed supply. Management was exactly the same for all animals.

All animals used in the trial were bred on "Eidsvold" Station. (A description of this property may be found in the *Queensland Agricultural Journal* for March, 1958.)

Unfavourable conditions were experienced during the trial; rainfall for 1957 was a record low. This was reflected in low weaning weights, and adversely affected the total weight-gain of both groups.

The trial groups formed part of a herd of about 200 head grazing mixed Rhodes grass and native pasture at a stocking rate of a beast to 6 acres.

Except for the last six weeks of the trial period, the pasture was dry and unpalatable.

### Weighings.

Liveweight—Initial Weighing, 5-9-57:

Average Liveweight—

| | |
|---|---|
| Hereford x S.G. Group .. | 344.5 lb. |
| Hereford Group .. .. | 344.4 lb. |

Liveweight—Final Weighing, 13-3-58:

Average Liveweight—

| | |
|---|---|
| Hereford x S.G. Group .. | 576.3 lb. |
| Hereford Group .. .. | 496.5 lb. |

The Hereford x Santa Gertrudis group made an average total gain of 231.8 lb. with an average daily gain of 1.2 lb. over the 189-day period. Over the same period the Hereford group made an average total gain of 152.1 lb. and an average daily weight gain of 0.8 lb.

Thus the Hereford x Santa Gertrudis group had the higher weight-gain performance, showing an average increased total weight gain of 79.7 lb. and an average daily weight gain of 0.4 lb. greater than the Hereford group.

### How They Handled.

The cattle were well handled by experienced stockmen; animals of both groups were equally docile, and gave no trouble in working. The cross-breds were more lively and alert than the Herefords, and gave the impression that they could be difficult if handled wrongly.

No diseases occurred in either group.

The conformation of the cross-breds appeared equal to that of the Herefords. A sleek, bright coat and free walk characterised the cross-breds.

During March, when the trial concluded, the cross-breds were mated at an average weight of 576 lb. They were then about 16½ months of age. The pure-breds will not be ready for mating until spring or early summer.

It will be of interest to observe if the cross-breds can maintain the advantage gained during the six months following weaning.

## War Against Cattle Tick

Strategic dipping or spraying and pasture spelling have been developed as powerful weapons to fight the cattle tick. These systems of cattle management reduce the number of dippings or sprayings over the year and represent very real savings.

Every year, the number of ticks in southern Queensland pastures suddenly increases in late October or November. This spring rise is caused by eggs of female ticks, laid some time previously, hatching more or less simultaneously. This build up is checked by commencing dipping in September, some time ahead of the spring rise. Dipping is then repeated at regular monthly intervals until late December or early January. Tick numbers are then so low that long intervals between dippings are satisfactory later in the summer.

In the tropics, seed ticks rarely live more than three months after the fall of the parent. There is, then, an opportunity to kill most of the larvae by spelling the paddocks until most of the ticks have died.

*—C. R. MULHEARN, Director of Veterinary Services.*

# The Tapeworm Your Dog Can Do Without

By D. J. WEBSTER, Assistant Veterinary Officer.

**Dogs need not have tapeworms. You, as a dog owner, can do something towards controlling the spread of tapeworms by (1) Keeping fleas in check; (2) burning offal; (3) treating infected dogs.**

On killing day in the Queensland sheep raising areas it may be truthfully said that every dog, that possibly can, will be present at the killing pen. This is the day they can drink blood and eat fresh lungs and liver, plus any other tit bit that the kind-hearted butcher may throw them.

Perhaps the butcher may find some cysts or water bladders adhering by slender necks to the walls of the skirt or belly or there may be some cysts embedded in the liver. The offending area containing the cysts will be removed as unfit for human consumption and thrown to the dogs, who, not being so particular will accept it gratefully. Perhaps the butcher does not realise as he sees the dogs eat these cysts, that he is maintaining the life cycle of a dog tapeworm, for these water bladders form a most important part of that cycle.

## SEGMENTS BREAK OFF.

A tapeworm, as the name suggests, has a long, flat body divided into easily recognisable segments. Its head is equipped with hooks by which it attaches itself to the inner lining of the intestine of the host. It increases in length by forming new segments behind the head. Each segment is equipped with male and female sex organs and in time produces eggs. When the eggs are formed the segment is said to be ripe and it will eventually break off from the rest of the worm and be passed out in the dog's droppings. Thus we have the beginning of the cycle.

Before these eggs can mature into adult tapeworms they must be eaten by what we call an intermediate host. This may be a sheep, pig, cow, wallaby or possibly a man. If this occurs, the eggs will move through the intestinal wall of the animal which eats them and eventually produce cysts within its body. The cyst in fact contains a tiny tapeworm or a number of worms and if this is eaten by a dog the small worm will grow to maturity inside the dog's intestine. At times cysts may be found in which the fluid has dried out, and which contain instead a hard, gritty substance. These are cysts which have died, and are no longer infective to dogs.

It would appear that of the many tapeworms which may infest dogs, four are common in Queensland. These to give them their full names are *Dipylidium caninum, Echinococcus granulosus, Taenia hydatigena* and *Diphyllobothrium erinacei.*

The adult *Dipylidium* may grow to two feet in length. Its ripe segments resemble a cucumber seed and are a reddish-yellow colour and may be seen moving about on newly excreted droppings. These segments excrete eggs as they move about and these eggs are eaten by the larval stage of the dog flea. The eggs will eventually form a cyst in the adult flea and if this flea is chewed up and swallowed by a dog, the cyst will develop into a mature tapeworm inside the dog. Thus the intermediate host for this worm is not a domestic animal but the common dog flea.

## HYDATID WORMS.

*Echinococcus granulosus* is a much smaller worm than *Dipylidium*. Its eggs are produced in the same way. These eggs may be picked up by sheep or in fact any domestic animal, or man. The cyst which these eggs produce is known as a hydatid. In sheep these cysts are found generally in the lungs and liver. The fluid in them may have a sandy appearance which is due to the presence of great numbers of tiny immature tapeworms. If eaten by a dog these tiny worms will mature to adult tapeworms in its intestines.

Throughout a number of years the incidence and life cycle of the hydatid tapeworm has received much attention, principally because man may become affected by the hydatid cyst, but also because of the economic loss which occurs when cyst-infested livers are condemned at abattoirs.

A recent survey of New South Wales showed that 25 per cent. of country sheep dogs examined were infested to some degree with this parasite. Similarly 20 per cent. of dogs employed around abattoirs were affected. Only 5 per cent. of city and country town dogs harboured the worm. Half of the country properties visited harboured at least one infected dog. It was also found that the incidence of this worm in some country sheep raising areas was significantly higher than in other areas.

A survey taken some 30 years previously showed similar figures for the variable incidence of *Echinococcus* amongst station, abattoir and town dogs.

## STATION DOG CARRIERS.

These figures serve to illustrate the fact that station and abattoir dogs, because of their access to fresh offal are, in general, the most important carriers of this parasite. The fact that the incidence in some areas is high and has been that way for some years suggests that climatic conditions may have some effect on the survival time of the eggs passed out by the dog.

It is a fact that the dingo will harbour this tapeworm, also cattle, pigs and wallabies can be infected with the hydatid cyst. Thus in cattle country, dingoes may play an important part in completing the life cycle of *Echinococcus*. In sheep country their role, however, would of necessity be very small as dingoes are usually more strictly controlled in these areas.

*Taenia hydatigena* is a tapeworm whose life cycle resembles *Echinococcus granulosus*. Its cystic stage may be found in sheep, cattle and pigs but most commonly in sheep. The cysts may occur in great numbers adhering by a slender neck to the abdominal wall. They may also be found in the liver. In Queensland this slender necked bladder worm is very common.

## THESE EGGS HATCH IN WATER.

*Diphyllobothrium erinacei* is a tapeworm whose life cycle differs somewhat from the other three. The eggs of this worm hatch in water into what are called coracidia. These coracidia can swim and for the cycle to progress they must be eaten by a water insect, usually a water flea. If a frog eats a flea infected with the immature forms of this tapeworm there will develop in the muscles of the frog tiny ribbon-like structures somewhat like small tapeworms. These we call plerocercoids. The life cycle from then on is very interesting for these plerocercoids are capable of changing their living quarters from one animal to another. For instance if a snake eats an infected frog the plerocercoids will move into the body of the snake. If a pig eats an infected frog the plerocercoids will move into the pig's muscles. Then if a man ate infected pork which was not properly cooked the plerocercoids could likewise move into his muscles. It would appear

that they may go on changing their home until they find their way into a dog, for example if a dog eats an infected pig.

These plerocercoids are commonly found in the muscles of wild pigs killed in Queensland. They have been given the name spargana and the disease which they produce in pigs is called sparganosis.

Thus we can see that the life cycle of this tapeworm differs somewhat from the others because it does not form cysts or water bladders within the intermediate host but instead takes the form of small ribbon-like structures interspersed between the muscles.

There is one fact that each life cycle has in common however and that is, for the completion of the cycle, the final host, the dog, must eat the raw flesh of the intermediate host. This fact is important when we consider effective means of controlling the spread of these tapeworms.

**The effects of light tapeworm infestations on dogs are sometimes over-rated but in severe cases they will block the intestines.**

**If all hydatid tapeworms were removed from dogs, humans and domestic animals could not contract hydatids.**

They do not suck blood but live upon the food that the dog eats.

## EFFECTIVE DRUGS.

Quite a number of drugs have been used to treat tapeworm infestations. The most successful to date has been arecoline hydrobromide. This drug has a purgative action which in most cases will expel the worms from the intestines. The purgative action may be painful and even dangerous if dogs are badly constipated. A tablespoon of paraffin oil the day before treatment will rectify this. A dose of ½ grain crushed up in water and given by mouth would be sufficient for most grown sheep dogs. The dog should be starved for 12 hours and then given a meal of bran and milk or some cereal and milk; approximately half an hour later the dose of arecoline should be given. Purgation should commence within a few minutes but sometimes the dog will vomit the medicine before it can act efficiently. To guard against this it may be wise to keep the dog on a chain and after administration of the drug take him for a sharp run until purgation commences.

Control of the spread of tapeworms may be achieved by breaking the life cycle. Keeping the flea population in check will serve to control *Dipylidium* caninum. The burning of offal on sheep properties is a practice to be recommended. This would prevent station dogs eating cyst-infected material.

# Virus Disease of Horses

An apparently new disease of horses has appeared in central Queensland. It is infectious and is probably due to a virus.

Mr. A. L. Clay, Director of the Division of Animal Industry, says that the symptoms of the disease are not very characteristic and can easily be confused with those resulting from worms. Affected horses lose condition, become weak and may develop dropsical swelling along the underpart of the body. In some cases a discharge from the eyes or nose is noticeable. There is fever in the early stages. This may recur at intervals but is often not noticed under station conditions.

Experimental work is being carried out at the Animal Research Institute, Yeerongpilly, to identify the disease. In the meantime, suitable precautions have been taken to guard against its spread.

# Stock Gazette

THE ability to kill ticks and its safety has won a place for DDT in many dipping vats in this State. For about a week after dipping, DDT persists on the coat of an animal. During this week the residual DDT is able to kill larvae picked up from the pasture. DDT has the advantage over related tickicides in that ticks do not readily develop a resistance to it at the usual concentrations recommended for use.

Fully engorged female ticks are relatively resistant to DDT as are certain of the nymphal stages. The persistence of DDT, however, allows many of the latter to be killed as they develop from the resistant stages at the last dipping.

DDT is only slightly soluble in water and its effectiveness in killing ticks depends on the proper mixing in the vat. DDT is deposited in the sludge that accumulates at the bottom of the vat. Before dipping, this sludge must be lifted from the bottom and dispersed throughout the dip. A square-nosed shovel with a long handle is useful for this purpose. The vat should be hand stirred with a wood or metal stirrer for 15 minutes before stirrer cattle are run through. *The use of stirrer cattle should be in addition to and not a substitute for hand stirring.* Should a delay in the dipping run extend for longer than 10 minutes, then stirrer cattle should be put through the dip. All cattle used as stirrers should be redipped.

As DDT is deposited on the coat of the cattle stripping occurs and the concentration of DDT in the vat falls. This is not so marked as with other hydrocarbon insecticides. Sampling of the dip immediately after dipping finishes should be undertaken regularly.

Dip samples are analysed at the Animal Research Institute, Yeerongpilly. When the result of the dip analysis is received the correct amount of DDT to bring the dip up to strength may be calculated.

Care should be taken also that the correct amount of DDT is added for the volume of water needed for topping up the dip.

With hand sprays DDT should be used at 1 per cent. concentration. In power sprays of high volume low pressure types, 0·5 per cent. concentration is adequate. The emulsion preparations are best for use with this type of spray as there is less clogging of spray jets and it is easier to mix than the paste preparations which require heating. Remember, for successful dipping with DDT: Rough guesses are not good enough; follow the manufacturer's directions for the DDT you use; pay particular attention to stirring the vat before commencing dipping.

*—J. FARRY, Veterinary Officer.*

MORE than 30 cattle died from barber's pole worm infestation in a mob travelling near Dirranbandi. The mob had been on the road for many weeks and feed along the stock route was poor. The cattle became weak, and this allowed the worms they had picked up to have fatal effects. The remainder of the mob was treated and given an opportunity to recover.

Phenothiazine is a very effective treatment for barber's pole worm. The worm is a blood-sucker and causes anaemia. It's usually most active in the summer, but sometimes in Queensland its effects don't show up until the winter. The feed often determines the symptoms that develop. When feed is good, symptoms might not be obvious. But even if the animals don't get sick, growth and production are affected.

*—W. R. RAMSAY, Veterinary Officer.*

# Treating Coccidiosis in Chickens

By P. D. RANBY, Veterinary Officer.

**The sulphonamide drugs, supplied in drinking water, are recommended for the treatment of coccidiosis in chickens.**

Coccidiosis, which kills young chickens over 10 days old, is caused by minute parasites which attack the gut. We may have caecal coccidiosis if the caeca (or blind-gut) are attacked, and intestinal coccidiosis if the small intestine is attacked.

Affected chickens appear dull and will not eat. They huddle together, with drooped wings, near the source of heat. (See Plate 1). Those affected by the caecal form, pass blood in the droppings. This is absent in the intestinal form.

In any case, post-mortem examinations should be performed. In the caecal form, the caeca (blind-gut) are inflamed and distended with blood and in the intestinal form, one finds the small intestine inflamed.

If any difficulty occurs, or if there is no response to treatment, veterinary advice should be sought.

## TREATMENT.

The sulphonamide drugs supplied in drinking water are recommended for outbreaks of coccidiosis. (Where

Plate 1.

**A Case of Acute Coccidiosis in a Seven-Week-Old Chick.** This chick was found affected by both the caecal and intestinal forms of the disease.

automatic waterers are used, these have to be turned off and the treatment supplied in open troughs).

Three sulphonamide drugs are commonly used for coccidiosis: (1) sodium sulphadimidine sold as a 16 per cent. solution, (2) sodium sulphamerazine sold as a 16 per cent. solution and (3) sodium sulphaquinoxaline sold as an 8 per cent., or a 5 per cent. solution.

Sulphadimidine and sulphamerazine are rather similar in action. They are quicker than sulphaquinoxaline in controlling acute outbreaks of coccidiosis and somewhat less toxic. On the other hand, sulphaquinoxaline is cheaper.

## DOSE RATES.

For any sulphonamide drug, the course of actual medication includes short "gaps" of a few days in which no drug is supplied (See Table 1.). This "spreads out' the treatment and permits some immunity to develop.

Initial dose is a little higher. If too high, the treated water becomes unpalatable. In the case of sulphaquinoxaline, it is necessary to keep up a higher dose for the first few days, otherwise the drug is not quick enough in bringing the attack under control.

## TIME TO TREAT.

If only a small number of chickens in a large flock show signs of coccidiosis and the rest appear bright, give only part of the full course of treatment, for example, give treatment for two days, stop and observe progress. If coccidiosis later becomes more general, continue treatment, until six days' actual treatment have been given.

The period of sulphonamide treatment is limited by the danger of poisoning. Hence if the full course is given when little coccidiosis is present, the disease may reappear after treatment ceases.

TABLE 1.

Dose Chart for Full Course Treatment.

| Day. | 16% Sulphadimidine or 16% Sulphamerazine. | 4% Sulphaquinoxaline. |
|---|---|---|
| 1 | 1½–2 fl. oz. per gal. water | 1½ fl. oz. per gal. water |
| 2 | 1 fl. oz. per gal. water | 1½ fl. oz. per gal. water |
| 3 | 1 fl. oz. per gal. water | 1½ fl. oz. per gal. water |
| 4 | No treatment | No treatment |
| 5 | No treatment | No treatment |
| 6 | 1 fl. oz. per gal. water | 1 fl. oz. per gal. water |
| 7 | 1 fl. oz. per gal. water | 1 fl. oz. per gal. water |
| 8 | No treatment | No treatment |
| 9 | If thought necessary, 1 fl. oz. per gal. water | If thought necessary, 1 fl. oz. per gal. water |

Various recommendations for periods and amounts of treatment are given by the manufacturers of these drugs. The dose chart (Table 1) is a working example.

To sum up, three days on, two off and two on. If thought necessary, a further day of treatment may be given.

## AVOID OVERTREATING.

Not more than six days of actual sulphonamide treatment should be given or poisoning may result. This is indicated by a second "set-back" in the chickens together with kidney damage. The kidneys appear very

pale and somewhat swollen. Cases of sulphonamide poisoning are not uncommon.

Another side-effect of prolonged sulphonamide treatment is bleeding brought about by the drug. This is recognised by bleeding in the muscles, heart and throughout the intestines.

## COMBINATION WITH PYRIMETHAMINE.

Recently a new drug called pyrimethamine, at extremely low levels, has been found to reduce the amount of sulphonamide drug required by about one-tenth. This holds good possibilities if these early results are repeated in practice.

Other measures in the campaign against coccidiosis are:

(*a*) *Warmth*—

Keep the chickens warm, as coccidiosis-affected chickens are rather susceptible to chilling.

(*b*) *Dried Milk*—

A dried milk product may be supplied as 15 to 20 per cent. of the ration for 7 to 10 days (only high levels can be relied upon).

(*c*) *Vitamin K*—

Vitamin K reduces bleeding and may be supplied in livermeal or good quality green feed but is really only effective if given a few days before bleeding occurs.

Remember treatment does not replace hygienic measures. Coccidiosis can be reduced by good management.

## To Restore Vigour

Tyne renovation increases rain intake and overcomes soil compaction.

# Tuberculosis-Free Cattle Herds. (As at 10th September, 1958.)

## Aberdeen Angus.

G. H. & H. J. Crothers, "Moorenbah," Dirranbandi
A. G. Elliott, "Ooraine," Dirranbandi
W. H. C. Mayne, "Gibraltar," Texas

## A.I.S.

M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
F. B. Sullivan, "Fermanagh," Pittsworth
D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
W. Henschell, "Yarranvale," Yarranlea
Con. O'Sullivan, "Navillus" Stud, Greenmount
H. V. Littleton, "Wongelea" Stud, Hillview, Crow's Nest
J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy
Sullivan Bros., "Valera" Stud, Pittsworth
Reushle Bros., "Reubydale" Stud, Ravensbourne
A. C. and C. R. Marquardt, "Cedar Valley," Wondai
A. H. Sokoll, "Sunny Crest" Stud, Wondai
W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
W. H. Thompson, "Alfa Vale," Nanango
S. R. Moore, Sunnyside, West Woorooolin
H.M. State Farm, Numinbah
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
D. G. Neale, "Grovely," Greenmount
A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
W. D. Davis, "Wamba" Stud, Chinchilla
Queensland Agricultural High School and College, Lawes
C. K. Roche, Freestone, Warwick
Mrs. K. Henry, Greenmount
D. B. Green, "Deloraine" Stud, Durong, Proston
E. Evans, Wootha, Maleny
T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
J. Crookey, "Arolla" A.I.S. Stud, Fairview, Allora
M. F. Power, "Barfield," Kapaldo
A. H. Webster, "Millievale," Derrymore
W. H. Sanderson, "Sunlit Farm," Mulgildie
R. A. and N. K. Shelton, "Vuegon" A.I.S. Stud, Hivesville, *via* Murgon
R. R. Radel & Sons, "Happy Valley," Coalstoun Lakes
C. A. Heading, "Wilga Plains," Maleny
G. S. and E. Mears, "Morden," M.S. 755, Toogoolawah

## Ayrshire.

L. Holmes, "Benbecula," Yarranlea
J. N. Scott, "Auchen Eden," Camp Mountain
E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
T. F. Dunn, Alanbank, Gleneagle

## Friesian.

C. H. Naumann, "Yarrabine" Stud, Yarraman
D. J. Pender, "Camelot," Lytton road, Lindum
S. E. G. Macdonald, "Freshfields," Marburg

## Guernsey.

C. D. Holmes, "Springview," Yarraman
A. B. Fletcher, Cossart Vale, Boonah
W. H. Doss, Degilbo, *via* Biggenden
A. C. Swendson, Coolabunia, Box 26, Kingaroy
C. Scott, "Coralgrae," Din Din Road, Nanango
R. J. Wissemann, "Robnea," Headington Hill, Clifton
G. L. Johnson, "Old Cannindah," Monto
A. Ruge & Sons, Woowoonga, via Biggenden
G. Miller, Armagh Guernsey Stud, Armagh, M.S. 428, Grantham
N. H. Sanderson, "Glen Valley," Monto

## Jersey.

Queensland Agricultural High School and College, Lawes
J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
J. F. Lau, "Rosallen" Jersey Stud, Goombungee
G. Harley, Hopewell, M.S. 189, Kingaroy
Toowoomba Mental Hospital, Willowburn
Farm Home for Boys, Westbrook
P. J. L. Bygrave, "The Craigan Farm," Aspley
R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
E. A. Matthews, "Yarradale," Yarraman
A. L. Semgreen, "Tecoma," Coolabunia
L. E. Meier, "Ardath" Stud, Boonah
A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
F. W. Verrall, "Coleburn," Walloon
C. Beckingham, Trouts road, Everton Park
W. E. O. Meir and Son, "Kingsford" Stud, Alberton, *via* Yatala
G. H. Ralph, "Ryecombe," Ravensbourne
Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
J. W. Carpenter, Flagstone Creek, Helidon
H. G. Johnson, "Windsor" Jersey Stud, Beaudesert
W. S. Kirby, Tinana, Maryborough
S. A. Cramb, Bridge st., Wilsonton, *via* Toowoomba
J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
W. C. M. Birt, "Pine Hill" Jersey Stud, Gundiah
T. Nock, Dallarnil
P. Fowler & Sons, "Northlea," Coalstoun Lakes
F. Porter, Conondale
H.M. State Farm, Palen Creek
B. T. Seymour, "Upwell" Jersey Stud, Mulgeldie

## Poll Hereford.

W. Maller, "Boreview," Pickanjinnie
J. H. Anderson, "Inverary," Yandilla
D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick.
E. W. G. McCamley, Eulogie Park, Dululu
Wilson and McDouall, Calliope Station, Calliope

## Poll Shorthorn.

W. Leonard & Sons, Welltown, Goondiwindi

# The Beef Carcass and Its Cuts

By A. A. SEAWRIGHT, Veterinary Officer.

**The farmer, the grazier, the butcher, the housewife—indeed most Queenslanders—will find points of interest in this article on the cutting up of a carcass of beef.**

When slaughtering has been completed, the beef carcass is split longitudinally into sides, the left side and the right side.

When the carcass is prepared for local trade purposes, the kidneys are left in place. The sides can then be readily differentiated by reference to the kidneys. In the right side, the kidney is fixed in the sublumbar region close to the backbone and in the left side, the kidney with its covering of fat hangs loose.

For carriage in conventional meat delivery vehicles and storage in butcher shop cold rooms it is necessary to split the sides into quarters.

For local trade purposes, the carcass is quartered so that one rib remains on the hind quarter and the remaining 12 are left on the forequarter.

For export purposes, three ribs are cut off with the hindquarter and 10 are left on the forequarter. When carcasses are quartered in this way the hindquarters and forequarters weigh

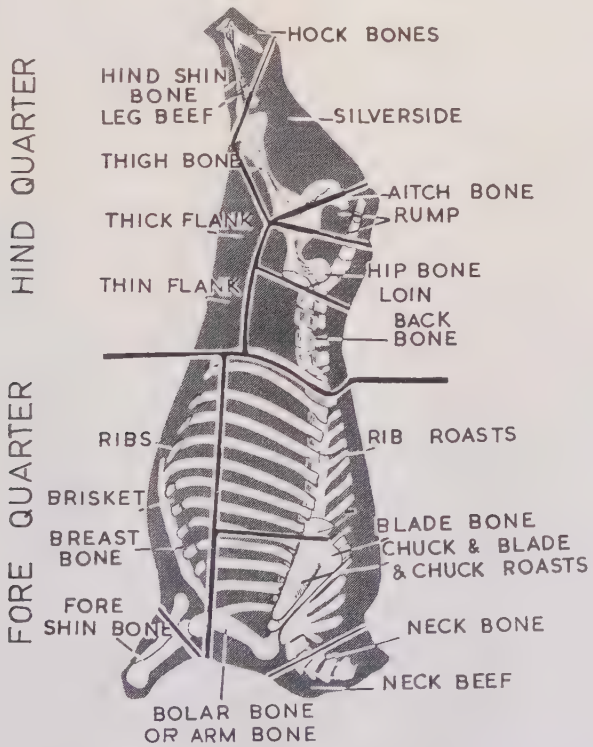



Plate 1.

**The Beef Carcass with its Bony Skeleton and Indicating the Principal Cuts.**

approximately the same. One rib hindquarters represents approximately 45 to 48 per cent. of the side.

## Quartering.

In order to divide a side into quarters, the inside aspect of the side is turned to face the butcher and the knife is passed into the space between the last and second last ribs as close as possible to the backbone and drawn out towards the brisket but not right through. A saw is then inserted into the opening made between these two ribs and the backbone sawn through. The forequarter is then hanging from the hind at the brisket end. A meat hook is then inserted between the second and third last ribs and the chine end of the fore hooked on to the rail. A cut of the knife then frees the brisket end of the fore and the forequarter and hindquarter both hang free. At this stage the hindquarter hangs with the hook inserted under the "hamstring".

## Primal Cuts—Hindquarter.

In the butcher's shop or boning room the quarters are then "broken down" into the primal cuts. On the hindquarter, the primal cuts are the rump, loin, topside, silverside, round, thick flank, undercut of the loin or fillet and leg beef. In order to break down the hindquarters, the hook suspending the quarter is first transferred from the "hamstring" to the underneath part of the leg beef on the opposite aspect of the bone. This is done most conveniently by inserting a hook under the leg beef and placing the other end of the hook over the bar. The quarter is then suspended by two hooks. The "hamstring" is then cut at its distal end and the quarter is then suspended by the hook inserted in the leg beef muscle.

In Plate 2 the hindquarter is shown suspended and ready for breaking down. The first operation is to remove the exterior flank meat, that flap which is shown in Plate 2 held off the loin by a wooden skewer. Next the cod fat, kidney, kidney fat and thin flank is removed. A horizontal cut is then made into the anterior aspect of the hind right to the bone level with the anterior tubercle of the "aitch bone". The quarter is now ready for removal of the thick flank.

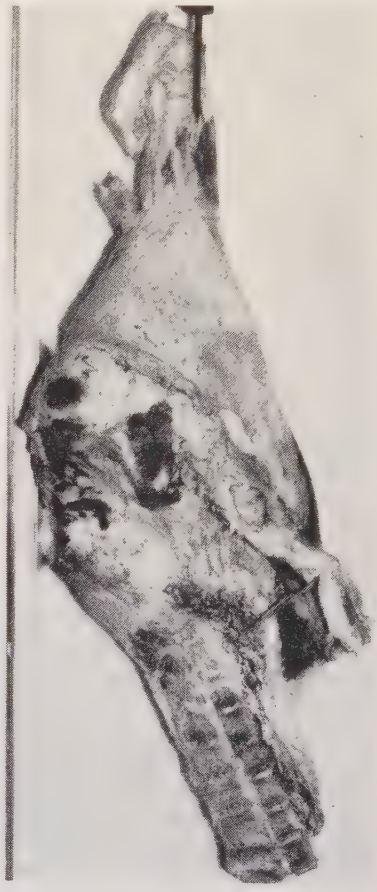


Plate 2.

**Hindquarter Suspended from Leg Muscle and Hamstring Severed.**

In order to remove the thick flank a cut is made at the base of the stifle joint as shown in Plate 3 so that when the thick flank comes away, the knee cap or patella is included. The intermuscular septum or the line dividing the muscles on the medial and lateral aspects is then felt and cut into with the knife. These knife cuts are perpendicular to the previous horizontal cut as shown in Plate 3. The thick flank is then pulled out and removed.

The butcher is now ready to remove the rump and loin in one piece. In order to do this the cup joint is felt and the quarter is sawn through this joint just above the sacrum at the posterior end of the vertebral column. A meat hook is inserted under the rib at the forequarter end of the loin and when the saw cut is made the rump and loin are taken away in one piece and hung up.

Plate 3.

**Cod Fat, Thin Flank, Kidney and Kidney Fat Have Been Removed and a Horizontal Cut Has Been Made into the Meat on the Anterior Aspect of the Quarter, Level with the Anterior Tubercle of the "Aitch Bone".** The thick flank is that cut on which the butcher has his hand.

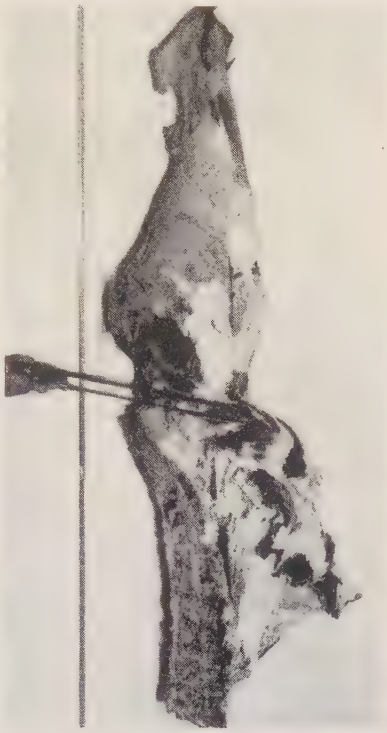


Plate 4.

**The Thin Flank Has Been Removed and the Butcher is Ready to Saw Through the Cup Joint Just Above the End of the Vertebral Column.** That part below the saw is the rump and loin in one piece.

Plates 5 and 6 show the dorsal and medial aspects of the butt which is what remains suspended after removal of the rump and loin. The next operation is to remove the topside which is that prismatic shaped group of muscles on the medial aspect of the thigh just above the "aitch bone".

The cut is started just above the level of the stifle joint as shown in Plates 5 and 6. The butcher then carefully feels for the intermuscular system between the topside and silverside on the dorso lateral aspect of the butt and when he has found the groove, cuts in right down to the pin bone as shown in Plate 5. The topside is then trimmed away from the thigh bone or femur right down to the "aitch bone". The cut is then

removed by sawing through at the cup joint and the pin bone. All that then remains on the hook are the silverside and the leg beef.

The silverside may then be trimmed away, leaving the leg beef and the thigh bone.

In this description it will be remembered that the rump and loin were removed together. The rump now has to be dissected away from the loin. On the carcass it will be remembered also that the rump is situated just posterier to the loin. The butcher finds the hip bone or coxal tuber of the ilium and cuts through along its anterior edge till the knife reaches the backbone. The backbone at this point is then cut through with the saw and the bone-in rump becomes separate from the loin. Rumps are not cut for the retail trade bone in and so the bones have to be dissected out. The bones are the last lumbar vertebrae,

Plate 5.

**The Dorsal Aspect of the Butt After Removal of the Rump and Loin.** The first cut has been made for removal of the topside.

Plate 6.

**The Medial Aspect of the Same Butt, Showing the Knife Cuts Involved in Removal of the Topside.**

Plate 7.

**The Remaining Cuts on the Butt After the Topside Has Been Trimmed Away.** The topside is that portion hanging farthest away from the hook. The silverside is that portion remaining between the leg beef (with the hook passing through it) and the suspended topside.

sacrum and ilium. The fillet is situated under the sacrum and last lumbar vertebrae and before the rump is boned out the fillet is dissected away.

## The Forequarter.

In breaking down the forequarter, the usual practice is to hang the quarter from an overhead bar as shown in Plate 8.

The first operation in breaking down the forequarter is the taking out of the blade. The butcher feels for the tuber on the spine of the scapula or blade bone. This point is situated at about the centre of the blade bone. The knife cut is then made through the outer selvage of fat, muscle and connective tissue parallel to the quarter cut or the last rib. This cut is taken right down to the blade bone as shown in Plate 9.

The posterior dorsal part of the selvage is quite loose and is pinned back with a meat hook as shown in Plate 9. This selvage is not cut away and as so left it makes an excellent cover for the rib roasts underneath when the retail cuts are being prepared. The knife cut is taken round the posterior dorsal edge of the blade bone and the chuck trimmed away from the under surface of the blade bone. The butcher cuts right down into the axilla or armpit and continues the cut round the anterior edge of the blade. The foreleg then readily comes away.

Plate 10 shows how the shoulder cuts are neatly removed from the forequarter. It will be observed that the selvage on the neck remains. The cuts removed include the blade steaks, the undercut of the blade which is on the side of the blade bone closest to the chest wall, the clod and the shin beef. The shin beef is that meat

Plate 8.

**A Forequarter of Ox Beef Ready for Breaking Down.**

lying along the forearm and is similar in appearance to the leg beef of the hindquarter. The clod is that cut of meat lying along the upper arm bone or bolar bone. In Plate 10 it is that meat situated between the upper limit of the forearm and the lower edge of the "sticking" or lower edge of the neck. Plate 11 shows an alternative procedure for taking out the bolar bone together with the shin beef and forearm bone (radius and ulna). In this method the blade and clod are left on the forequarter at this stage.

In Plate 10 the cut surface of the chuck steak is seen at the most dorsal edge of the cut selvage. This is a large muscle which obliquely fans out across the lower chest wall and in this photograph is covered by white connective tissue sheets.

The next stage is the removal of the brisket and plate. As shown in Plate 10 the knife cut is made longitudinally and parallel to the chine. The cut is made so as to pass over the junctions of the rib cartilage with the rib bones. The knife cut which does not cut

Plate 9.

**The First Cut in Breaking Down the Forequarter.** The cut is made over the centre of the blade and parallel to the last rib. The outline of the blade bone can be readily seen and the ticket is placed on the blade steak.

Plate 10.

**The Blade and Shoulder With Shin and Bolar Has Been Neatly Cut Out.** Note the long cut parallel to the chine which removes the brisket and plate.

Plate 11.

**Demonstrating an Alternative Method of Breaking Down for Forequarter by Just Removing the Shin and Bolar.**

through these joints is used as a guide for the saw. The brisket and plate then come away separately from the remainder of the forequarter. The brisket is the foreleg end of this cut and the plate is the rib end.

The last stage in the break down of the fore into its primal cuts is the removal of the chuck and neck. A deep cut is made along the line of the cut selvage as shown in Plate 12 parallel to the quarter cut. This cut is made so as to include three or four ribs. The medial aspect of sectioning the ribs and sawing through the vertebral column is shown in Plate 13. The

tissue in between the cut ribs in Plate 13 is the chuck and it is cut through along the line of the posterior rib of the section. The large posterior irregularly rectangular slab is the set of rib roasts. The forequarter is broken down in an organised way such as has been described in order that the least possible waste results and so that retail cuts may be prepared from these primal cuts in a neat and attractive way.

There are other good and conventional methods of breaking down carcass beef into its primal cuts. In some boning rooms the shin is sawn off at the elbow joint before breaking down proceeds. For the purposes of export to the United Kingdom, briskets and shins are cut off with the saw and the remainder of the forequarter is called the crop. This operation is referred to as "cropping." Carcasses are broken down in many different ways to suit different purposes but the method chosen for description here is widely employed in the meat trade and is a method which is easy to follow.

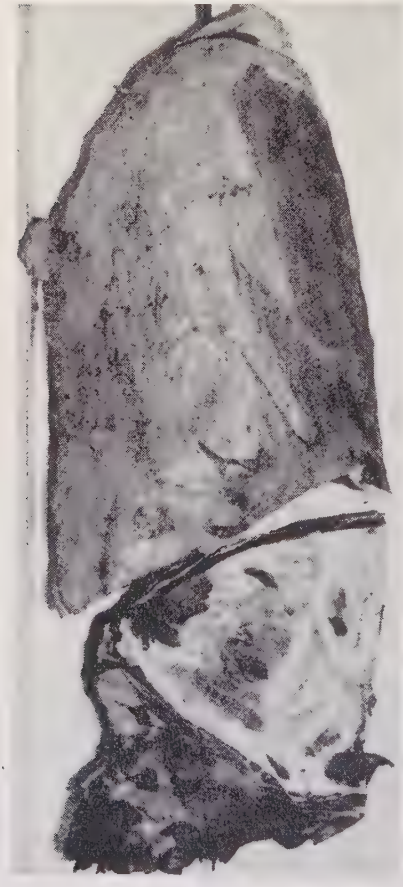


Plate 12.

**Removal of Chuck and Neck.**
Lateral aspect.

Plate 13.

**Removal of Chuck and Neck.**
Medial aspect.

(*Next month an article will be published describing cuts of beef for the housewife.*)

*Potted Facts—III*

# Grain Sorghum

By R. V. RILEY, Division of Marketing.

**New varieties, together with increased demand for feed grains due to war-time shortages, helped to establish the grain sorghum industry in Queensland.**

Grain sorghum is a crop which comes within the classification—coarse grains. In Australia it has been used exclusively for stock feeding, although in some eastern countries it is also used for human consumption. It is interesting to note that when the grain is polished it has something of the appearance of rice, but it is very hard and requires long cooking.

The main growing areas in this State are the Darling Downs, the Burnett, Dawson-Callide and the Peak Downs areas of Central Queensland. In recent years the most rapid expansion of plantings has occurred in the Dawson-Callide.

Before World War II., so little was grown that the figures of production were not collected separately. When first grown here the plants were very tall and were difficult to harvest. Farmers were reluctant to grow grain sorghum.

Harvesting problems, however, were overcome by the development of dwarf, high-yielding varieties, which could be harvested by cereal grain harvesting machinery already owned by the farmer. These new varieties, together with the increasing demand for feed grains due to war-time shortages, helped to establish the industry.

Plate 1.

**A Head of Queensland-bred Alpha Grain Sorghum.**

From the first recorded planting of 4,397 acres in 1939-40 the acreage steadily grew to 116,079 acres in 1947-48.

The crop is grown in roughly the same areas as the winter grains—wheat, barley and oats. Thus grain sorghum, which is a summer crop with planting season from about October to January, is regarded as an alternative

TABLE 1.

QUEENSLAND—GRAIN SORGHUM—AREA, PRODUCTION AND YIELD PER ACRE.

| Year. | Area. | Production. | Yield per Acre. |
|---|---|---|---|
| | Acres. | Bushels. | Bushels. |
| 1947–48 .. .. | 116,079 | 3,335,322 | 28·7 |
| 1948–49 .. .. | 48,011 | 899,136 | 18·7 |
| 1949–50 .. .. | 99,362 | 2,157,717 | 21·7 |
| 1950–51 .. .. | 166,311 | 3,683,286 | 22·1 |
| 1951–52 .. .. | 169,558 | 2,651,799 | 15·6 |
| 1952–53 .. .. | 190,619 | 3,239,133 | 17·0 |
| 1953–54 .. .. | 181,819 | 4,039,779 | 22·2 |
| 1954–55 .. .. | 202,532 | 5,082,762 | 25·1 |
| 1955–56 .. .. | 155,527 | 3,960,195 | 25·5 |
| 1956–57 .. .. | 171,705 | 4,243,227 | 24·7 |

(Source: Commonwealth Statistics.)

to the cereals. In the event of a poor winter season, farmers can, provided early summer conditions are favourable, make up some leeway by planting grain sorghum. The crop is susceptible to frost damage and is a risky proposition if planted after December in areas subject to frost.

The stubble remaining after harvesting provides grazing at a time when the food value of natural grasses and pastures is at a low level. In recent years the value of the crop for silage has been established and plantings for this purpose have been made in western and north-western districts.

Expansion of plantings for grain in the last 10 years has been into areas of less reliable rainfall. The crop is capable of making strong second growth which will make grain in the event of the normal wet season being delayed. This occurred in 1947 and accounts for the inflated yield and high production figures in 1947-48.

From 1947 until 1956 the marketing of the crop was done by individual growers who formed voluntary annual pools. Towards the end of that period, when world grain production had overcome shortages resulting from the War, the international market hardened.

## Marketing Board in 1956.

Industry organisations asked for a marketing board to be set up under "The Primary Producers Organisation and Marketing Acts." Following a referendum of growers the Grain Sorghum Marketing Board was constituted on March 8, 1956, and depots were established at Brisbane and Gladstone.

Table 2 shows quantity and value of overseas exports of grain sorghum from Queensland. Until 1944-45 the United Kingdom and India were the main markets, but in the last two years Japan has come into the picture on about the same level as the United Kingdom.

TABLE 2.

QUEENSLAND—GRAIN SORGHUM OVERSEAS EXPORTS.

| Year. | Quantity. | Value. |
|---|---|---|
| | Tons. | £A. |
| 1949–50 .. | 18,723 | 340,830 |
| 1950–51 .. | 50,705 | 1,122,717 |
| 1951–52 .. | 37,055 | 1,097,110 |
| 1952–53 .. | 46,692 | 1,439,507 |
| 1953–54 .. | 41,215 | 876,049 |
| 1954–55 .. | 44,112 | 849,819 |
| 1955–56 .. | 20,479 | 392,455 |
| 1956–57 .. | 19,912 | 377,642 |

(Source: Oversea Trade.)

The expansion of grain sorghum growing received its first impetus as a result of a price guarantee by the Poultry Farmers Co-operative Society Ltd. In 1936, after the Department of Agriculture and Stock had shown the worth of using grain sorghum as a poultry food, the Society guaranteed a price for up to 500 tons.

As seasons went on, the guarantee was continued at an increased rate. By 1944 the Society was using up to half a million bushels of grain sorghum in its poultry feeds and mashes.

During the later war years, grain sorghum was the subject of Government guarantees. The aim of the guarantee was to increase the growing of the crop for the purpose of supplementing wheat for stock feed. It will be recalled that grain sorghum was at this time subject to war-time price control.

Further impetus to the expansion of grain sorghum growing in central Queensland came from the setting up of the Queensland-British Food Corporation in the Peak Downs area, in 1948-49. The main purpose of the Corporation was to provide grain for the United Kingdom market; surplus grain was to be fed to pigs to provide pigmeat for the same market.

After approximately four years of facing up to difficulties of large scale operation, inadequate rainfall and the ravages of frost, the scheme was wound up following the 1952 crop. However, the Corporation opened up agricultural land and proved that it was possible to grow grain in an area of unreliable rainfall. This has encouraged growers in that area as individuals to successfully combine cropping with cattle raising.

Plate 2.

**Alpha Grain Sorghum Growing on the Darling Downs.** This crop was estimated to yield 30 bags to the acre.

# Brucellosis-Tested Swine Herds

(As at 10th September, 1958.)

## Berkshire.

S. Cochrane, "Stanroy" Stud, Felton
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
H.M. State Farm, Numinbah
G. L. Gabanko and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
C. E. Edwards, "Spring Valley" Stud, Kingaroy
V. F. Weier, "Sa Crescent," Clifton
N. Rosenberger, "Nevrose," Wyreema
B. Osborne and Dr. J. W. Best, Miltown Stud Piggery, Warwick
W. Young, Kybong, via Gympie
E. J. Clarke, Mt. Alford, *via* Boonah
G. McLennan, "Murcott" Stud, Willowvale
C. F. W. and B. A. Shellback, "Redvilla" Stud, Kingaroy
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
E. R. Kimber, Block 11, Mundubbera
A. J. Potter, "Woodlands," Inglewood
Regional Experiment Station, Hermitage
J. W. Bukowski, "Secreto" Stud, Oxley
R. Astbury, "Rangvilla," Pechey
L. Pick, Mulgildie
D. G. Grayson, Killarney
A. French, "Wilson Park," Pittsworth
D. Ludwig, Cainable, via Beaudesert
J. & S. Kahler, East Nanango

## Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood.
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood.
H. R. Gibson, "Thistleton" Stud, Maleny
H.M. State Farm, Numinbah
V. P. McGoldrick, "Fairymeadow" Stud, Cooroy
S. T. Fowler, "Kenstan" Stud, Pittsworth
W. Zahnow, Rosevale, *via* Rosewood
Regional Experiment Station, Biloela
G. J. Hutton, "Grajea" Stud, Cabarlah
H. L. Larsen, "Oakway," Kingaroy
A. Palmer, "Remlap," Greenmount
G. I. Skyring, "Bellwood" Stud, *via* Pomona
G. Pampling, Watch Box road, Goomeri
M. Hall, "Milena" Stud, D'Aguilar
K. B. Jones, "Cefn" Stud, Pilton road, Clifton
Barron Bros., "Chiltern Hill," Cooyar
K. F. Stumer, French's Creek, Boonah
Q.A.H.S. and College, Lawes
R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri
L. Stewart, Mulgowie, *via* Laidley
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes, Brisbane
R. Kennard, Collar Stud, Warwick
A. C. H. Gibbons, Mt. Glorious
A. Kanowski, "Exton," Pechey
L. C. and E. Wieland, Lower Cressbrook
P. L. and M. T. D. Hansen, "Regal" Stud, Oaklands, Rangeville, Toowoomba.
P. F. Ives, Capalaba
D. Ludwig, Cainable, via Beaudesert
J. C. Lees, "Bridge View" Stud, Yandina
R. Rhodie, Clifton
C. Assenbruck, Mundubbera
A. J. Mack, Mundubbera

## Tamworth.

D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
Department of Agriculture and Stock, Regional Experiment Station, Kairi
F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
H. J. Armstrong, "Alhambra," Crownthorpe, Murgon
R. H. Coller, Tallegalla, *via* Rosewood
D. V. and P. V. Campbell, "Lawn Hill," Lamington
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
L. C. and E. Wieland, Lower Cressbrook

## Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
C. R. Smith, "Belton Park" Stud, Nara
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale" Stud, 492 Beenleigh road, Sunnybank
Kruger and Sons, "Greyhurst," Goombungee
A. Scott, "Wanstead" Stud, Grantham
G. C. Burnett, "Rathburnie," Linville
R. A. Collings, "Rutholme" Stud, Waterford
A. J. Mack, Mundubbera
J. Ashwell, "Greenhill," Felton South

## Large Black.

E. Pointon, Goomburra

# Fruit Drop Can be Prevented

By A. J. CROCKER, Adviser in Horticulture.

**Control of pre-harvest fruit fall in Ellendale mandarins can be achieved effectively by applying a 2,4-D spray about two days before the expected drop.**

When nearly mature fruit begins to fall from his trees, the citrus grower has every reason to worry, for the fall represents a loss of time and money, Pre-harvest fruit drop, as it is called, is particularly severe in the Ellendale mandarin, an important variety in the Gayndah district.

## Natural Shedding.

The better known types of citrus such as the orange, mandarin, lemon and grapefruit normally produce a big surplus of blossom. In fact, if 6 per cent. of the flowers set and develop into fruit, the trees would normally

Plate 1.

**The Burnett River.** From orchards on the banks of the river come Australia's finest Ellendale mandarins.

carry a bumper crop. Fruit shedding is therefore nature's method of adjusting the crop to the vigour of the trees. Without it, over-bearing would occur and the tree would gradually weaken and die.

There are two main, natural periods of fruit shedding in citrus trees. The first occurs very soon after blossoming; the second is that generally known as the pre-harvest crop.

The natural shedding of the fruit is preceded by the development of a corky abscission layer at the point where the fruit is attached to the fruit stalk. As this layer forms, the supply of sap is gradually cut off from the fruit. When the layer is complete, the cork cells separate easily from one another and little force is required to dislodge the fruit. This is the normal method by which the plant sheds both unfertilized flowers and mature fruits containing viable seed.

The development of the abscission layer is controlled by the hormone balance in the tissues. The tendency of the flowers to abscise, for example, is inhibited by pollination which is accompanied by an increase in the concentration of certain hormones in the tissues. In the absence of pollination, the flower or young fruit readily falls from the tree.

## Induced Fruit Fall.

A number of factors are frequently responsible for inducing premature fruit shedding in citrus. Among these are injuries caused by pests and diseases, spray burn, lack of vigour in the tree and irregularities in soil moisture.

Insect pests such as the bronze orange bug, the larger horned citrus bug and fruit fly often injure the fruit sufficiently to cause fruit drop. Diseases such as brown spot in the Emperor mandarin and black spot can also take a heavy toll of fruit before it is ready for harvesting. Insecticides and fungicides applied at the wrong concentrations or in excessively hot weather may cause heavy premature fruit fall.

The orchardist must ensure that the trees are well grown and amply supplied with water and plant foods; a short period of unthriftiness when the tree is carrying a heavy crop can have disastrous results. The nitrogen supply must be maintained at an adequate level throughout the period of crop development. A deficiency of this plant food is a frequent cause of heavy fruit shedding during the November-December period.

Storms, hail and strong winds often result in a heavy fruit drop. Hot, dry winds immediately after blossoming often prevent setting, or dislodge the newly-set fruit, so any protection that can be provided by wind breaks is highly desirable.

## The Ellendale Mandarin.

The loss of fruit just prior to harvesting is very marked in the Ellendale mandarin. This weakness in the variety tends to restrict the harvesting period, and prevents the grower from exploiting the payable market for good quality mandarins late in the season.

An extended harvesting period permits the grower to make the best possible use of his staff and reduces his commitment for casual labour which often lacks sufficient experience for the skilled job of packing and handling the fruit.

## Preventing Drop.

When the pre-harvest drop in Ellendale mandarins is controlled effectively, a considerable quantity of fruit which would otherwise fall to the ground is marketed.

Losses can be minimised to some extent by planting the variety in a locality where climatic conditions are

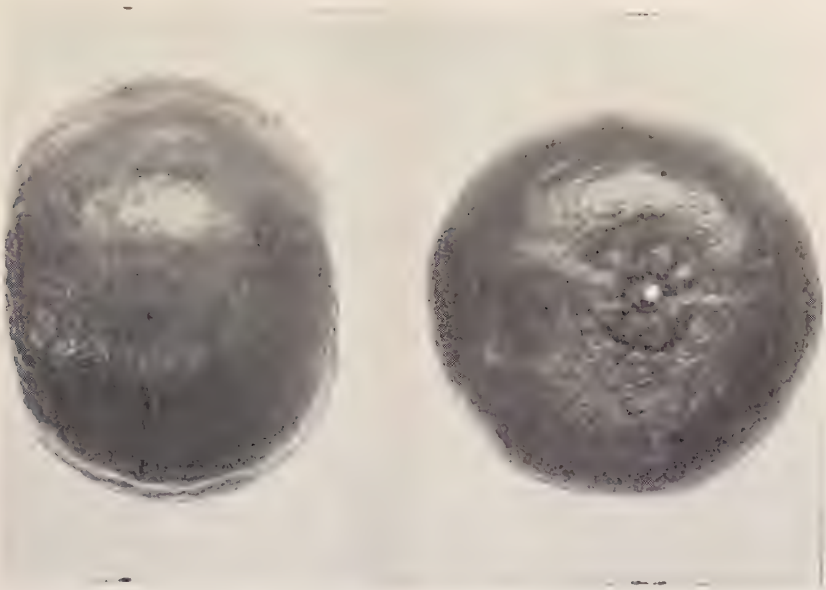


Plate 2.

**Ellendale Mandarin.** A late season variety grown commercially in subcoastal areas under irrigation. It is susceptible to pre-harvest drop.

Plate 3.

**Fertilizing the Citrus Orchard.** Money spent on fertilizer may be wasted if fruit drop is not controlled in Ellendale mandarins.

suitable for it. Such areas are sheltered from strong winds and low temperatures. Sufficient water for irrigation is essential in districts where the rainfall is low or unreliable. Where irrigation is a normal practice, the soil moisture must not be allowed to dry-out, particularly during the spring and early summer months.

Satisfactory control of pre-harvest drop in Ellendale mandarins has been obtained by a number of growers who,

each year, apply a spray containing 22 p.p.m. of 2,4-dichlorophenoxyacetic acid (2,4-D). Sufficient spray is used to give a fairly complete coverage to the tree without causing any run-off; about 4 gal. of spray is adequate for an average size tree in full bearing.

Since the 2,4-D becomes effective from 24 to 48 hours after application, the spray is applied about 2 days before the expected drop, that is, normally in late June. The effect of the 2,4-D gradually diminishes until after a period of 2-3 weeks and even earlier, if cool temperatures are recorded in the orchard, it is no longer of value in preventing fruit drop. If it is desired to extend the harvesting period further, a second 2,4-D spray may be applied.

### Precautions.

As 2,4-D can cause considerable damage to citrus trees when used at concentrations higher than 22 p.p.m. care must be taken to ensure that the strength of the spray is correct. The labels on commercial preparations of 2,4-D usually give the dilutions required for the spray; these directions should be followed precisely.

Distortion of leaves and young growth may occur with 2,4-D even at the relatively low concentration of 22 p.p.m., if the spray is applied while the tree is throwing out new leaves. It should not be used, therefore, during a flush of growth when the young leaves are numerous and tender.

Should a period of very low temperatures occur after the 2,4-D spray has been applied, it is wise to keep a regular check on the trees. In some localities, the fruit falls very readily after extreme low temperatures have been recorded; 2,4-D sprays will not prevent fruit drop under such conditions, particularly when soil moisture is below normal.

## *Fertilizers for the Farm and Garden*

*Fertilizers for the Farm and Garden* is the latest of the agriculture and livestock series being published in Australia by Angus and Robertson Ltd. The main aims of the book are stated to be, "to present the case for the scientific use of fertilizers, to show farmers how to improve the yield and prevent deterioration on good land, and to indicate the way to the conversion of low-productive and waste land into valuable and fertile farms."

The book begins by describing the development of fertilizers in agricultural practice and goes on to discuss successively soil and plant inter-relations, the assessment of nutrient requirements of soils, world resources and usage, application of fertilizers, reactions in the soil, and experiments and usage.

The chapter that will probably interest farmers and gardeners most will be that dealing with diagnosis and fertilizer recommendations.

*Fertilizers for the Farm and Garden, L. J. H. Teakle and R. A. Boyle,* 384 *pages,* 27 *illustrations, price* 63s., *Angus and Robertson Ltd., Sydney.*

# Certified Tomato Seed

By A. R. CARR, Experimentalist.

**On some farms—not the better ones—you often hear the phrase, "Near enough is good enough." One of the objectives of the Department of Agriculture and Stock has been to keep this slogan out of the tomato industry by insisting on the necessity for first class seed of varieties suited to the several producing districts. The current demand for certified tomato seed is proof, if that is needed, of the success achieved during the past 14 years.**

Tomato seed certification was inaugurated in Queensland in 1948 primarily to improve both yield per acre and fruit quality in the tomato crop throughout the State. Both were at a very low ebb at that time and the position was particularly bad in the Granite Belt where the crop is grown during the summer months.

Exhaustive trials were carried out, in the Stanthorpe district in the four-year period 1944-48, to determine the types most suited to local conditions. In these trials, many varieties from a number of sources were tested in the field. By rigid selection within these varieties, reasonably pure strains were isolated which satisfied the basic requirements for yield, plant type, fruit shape and quality, carrying capacity and resistance to drought, sunscald and cracking. Four of these strains were selected for production under the auspices of seed certification.

The Seed Certification Scheme is administered under *"The Agricultural Standards Act of* 1952" by a Seed Certification Committee. Among other things, the rules prescribe isolation requirements, the type of mother seed to be planted, methods of crop management both in the seedbed and the field, and methods of seed extraction and packaging.

Crops are not eligible for certification if bacterial canker appears in the area, if plants showing symptoms of virus disease infection, such as big bud and mosaic, are not promptly eradicated, and if more than one per cent. of the plants in the registered area show symptoms of fusarium wilt and are not destroyed before harvesting.

A further point of interest is the emphasis placed on harvesting fruit for seed extraction before harvesting for market is permitted. This practice means that only the best fruit on the plant is used as a source of seed.

## Varieties.

At the inception of the Seed Certification Scheme, four varieties—Q1, Q2, Q3 and Q4—were approved for certification. Production of Q1, a variety with pale-skinned fruit, was discontinued in 1954 because of its susceptibility to internal browning—a physiological disorder which sometimes proved troublesome—and its uncertain carrying qualities at certain periods of the year. Q4 also went out of production in 1953; in that year, the strain showed a tendency to lose fruit size in the later picks and was replaced by Q5, a somewhat similar strain without this defect.

Current production is therefore restricted to three varieties—Q2, a selection from Grosse Lisse, Q3, which exhibits some of the plant characteristics of Pearson, and Q5,

Plate 1.

**Cluster of Q3 Fruit.** Q3 is a certified variety which does particularly well in North Queensland.

Plate 2.

**Fruit of Q3 Tomato.** It is firm with solid flesh and carries very well over long distances.

a heavily foliaged strain with a remarkably good cropping record. These three types provide a range of material suitable for most requirements in Queensland.

The more important tomato growing districts have distinct preferences for particular types. Thus, Q3 is in strong demand at Bowen and elsewhere in North Queensland where cool temperatures during the flowering period are seldom a problem. Q2 and Q5, on the other hand, are generally preferred by growers in coastal areas of southern Queensland and at Stanthorpe.

In some years, the industry demand for certified tomato seed has not been satisfied because crops registered for certification failed to comply with the exacting requirements of the scheme. However, production has always been sufficient to feed substantial quantities of accredited seed into the industry and set standards by which growers can assess both their own strains and other types on the market. During the 1949-55 period, production fluctuated between 1,100 oz. and 3,250 oz. In the last two years, however, production has increased to 10,000 oz.—a considerable amount of seed.

## Importance to the Industry.

The tomato is the most important vegetable crop grown in the Stanthorpe district where about 400,000 cases of fruit are marketed each year. Before tomato seed certification, average yields were about 200 half-bushel cases per acre. Compare this with the present average for the Q strains of between 800 and 1,200 half-bushel cases per acre. In this district alone, the increase in production per acre more than justifies the scheme, quite apart from the improved fruit quality and the reduced losses from diseases such as canker.

Instead of "near enough is good enough," the tomato industry can now boast "quality first, quality second and quality all the time."

The progress of the industry at Stanthorpe since the introduction of Q strains is at least equalled by that in North Queensland, where Q3 is now one of the best known and highly valued varieties. Fruit quality in consignments from this area has improved beyond all recognition. Perhaps more important, however, is the extended growing period which the variety made possible: production now continues until the end of November.

## Grower Loyalty.

Growing certified tomato seed is an exacting business for it involves a great many hazards. Crops are rejected for certification from time to time because of disease incidence, the grower may incur financial loss when the value of the fruit on the fresh fruit market is greater than its value for seed extraction, and mishaps in extraction may lead to the condemnation of bulk lines of seed which fail to comply with prescribed germination standards.

The tomato industry owes a debt of gratitude to the growers who have co-operated with the Department of Agriculture and Stock in this service at considerable inconvenience to themselves. Without their loyalty to the project, tomato growing would certainly be a less flourishing industry than it is to-day. Growers associated with the scheme at the present time are:—

Q2—Messrs. Harslett Bros., Amiens.

Q3—C. Couchman, Glen Aplin.

Q5—Messrs. H. & C. Parrington, The Summit.

Growers not now in production but whose services to the project in its earlier and more difficult pioneering years deserve recognition are Messrs. E. Wain, Bapaume, and R. Carnell, Severnlea.

# Green Fingers

DESUCKERING is a form of pruning the banana plant and its aim is to raise the production of the plantation.

Plant growth should be kept down to one follower to each stool. The best crops are produced in those plantations where the one-bunch, one-follower system is adopted.

He recommends quickly destroying all suckers that come up after the follower has set. If additional suckers are allowed to remain on the parent plant, they reduce its vigour, delay cropping and adversely affect the yield. For this reason, regular desuckering is a "must" throughout the whole life of the plantation.

The main benefits of desuckering are correct development of the follower; control of bunching and cropping; improving the size, quantity and quality of the fruit; and prolonging the productive life of the plantation.

*—J. WILLS, Senior Adviser in Horticulture.*

AS with every crop, an adequate supply of soil moisture is required by beans before maximum yields can be produced. Supplementary irrigation is therefore generally required in coastal Queensland where the crop is grown in autumn, winter and late spring months. During this period, rainfall is generally inadequate.

Therefore, in recent years, there has been increasing use of irrigation water. This raises problems such as what irrigation system should be used, when should water be applied, and how much water is needed at each irrigation.

It is essential to maintain adequate soil moisture from the time of planting to the completion of harvesting, in the case of green beans, and until the plants are dying off in the case of seed bean crops. This involves the equivalent of 12 acre inches of water or approximately 260,000 gallons of water per acre under crop.

There are two main methods of irrigation generally available to the bean farmer—furrow irrigation and spray irrigation. Both have much to commend them. Furrow irrigation is generally the less costly of the two methods, but it is only suited to level or nearly level ground. Spray irrigation is better adapted for undulating and hilly country and in areas where water supplies are limited.

*—D. A. GRIFFIN, Assistant Experimentalist.*

AFTER a pineapple crop has finished its productive life, the old plants should be worked into the soil. They are a valuable source of humus and up to 50 tons of green material an acre can be returned to the soil.

The best time to break up your old patch is immediately after the last fruit have been harvested. At this stage the plants are still fairly succulent and are less difficult to handle than when they are dry and tough.

For chopping up the old plants, cutaway disc harrows or heavy rotary hoes are suitable. The result is more effective if the implements are put over the area more than once.

Liming and a green manure crop should then follow. Maize, sudan grass, velvet beans, pigeon peas or cowpeas are suitable for spring plantings, and oats or wheat for the winter.

*—K. KING, Senior Adviser in Horticulture.*

# Remaking Worn Concrete Floors and Paths

By H. WOODINGS, Silo Construction Officer.

**When a concrete path or floor reaches the stage where patching or repair work is obviously a waste of time, it is usual to replace it with a new one. To save work and expense however, it is often possible to adopt a very simple procedure known as the "penetration" method of laying a concrete path.**

The name itself suggests the purpose of the work. It is to penetrate a mass of broken stones or bricks with a fairly soft cement-sand mortar and so bind them into one unit.

The way to proceed with this method of repairing a badly damaged path or floor is to place a length of timber on each side of the area. This is done in the same way as when preparing for a new path, the boards being held in position by wooden pegs driven into the ground on the outside.

The top edge of these boards should be slightly higher (say half an inch) than the existing path, to allow for topdressing.

After this, a heavy hammer or pick is used to smash the path itself into fragments, and the pieces are so arranged that they present sharp edges and crevices for the reception of the cement mortar.

**Thus the only materials required will be sand and cement, and these could be mixed with water to form a mortar in the proportions of three parts of sand to one part of cement.**

Plate 1.

**Making a Concrete Floor or Path by the Penetration Method.** Above: Breaking up the old concrete. Below: Pouring the thin mortar from a bucket over the broken concrete particles.

Unlike the usual cement for concrete repair or construction work, where the patching mortar is of fairly stiff consistency, the "penetration" method calls for a comparatively thin mortar or "grout." The reason for this is obvious when we realise that it must find its way through and around the mass of rubble which forms the bulk of the path.

An old bucket, or even a large watering can, can be used for applying the mixture. Simply pour the

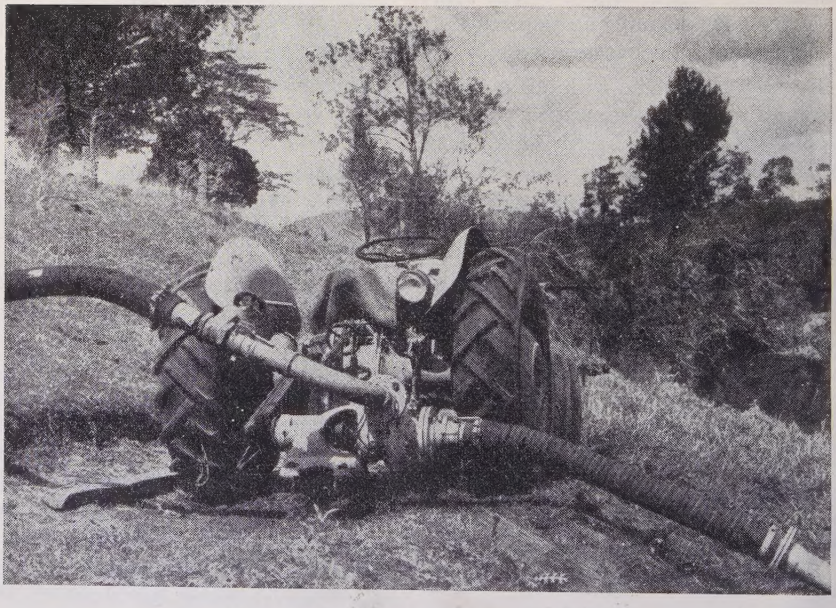
liquid mortar over the broken stones, and it will find its own way into all the cracks and cervices.

After a time, the mortar gradually builds itself above the level of the stones or broken sections of old path to the top edge of the boards on each side. From there it is levelled off with a wooden straight-edge or screed, and finished with a wooden float.

A very necessary precaution to note when doing this job is that the broken mass must be dampened well before pouring the mortar, so as to reduce suction. Also the finished job should be kept covered for several days so that it dries out gradually.

**It would not be correct to say that a path or floor built on the penetration method would be as strong as one carried out with a full-strength standard concrete mixture such as would be necessary for heavy traffic. The method can, however, be used with every satisfaction for many household and farm jobs. For the average garden path or laundry floor, for example, it will give ample strength and will save time, labour and expense.**

## Time and Tide



A directly mounted irrigation pump saves time and removes valuable equipment from flood risk.